ELEMENTARY SCIENCE BY GRADES

Book Three

LIBRARY

BUREAU OF EDUCATION

DEPARTMENT OF THE INTERIOR

LT
Q209
D45
1928
Bk 3

6—1132

ELEMENTARY SCIENCE BY GRADES

EDITED BY

FRANK W. BALLOU, PH.D.

SUPERINTENDENT OF SCHOOLS, WASHINGTON, D. C.

ELEMENTARY SCIENCE BY GRADES

BOOK THREE

ELEMENTARY SCIENCE BY GRADES

EDITED BY

FRANK W. BALLOU

SUPERINTENDENT OF SCHOOLS,
WASHINGTON, D. C.

BOOK I.	*By* ELLIS C. PERSING *and* ELIZABETH K. PEEPLES. *In preparation.*
BOOK II.	*By* ELLIS C. PERSING *and* ELIZABETH K. PEEPLES.
BOOK III.	*By* ELLIS C. PERSING *and* ELIZABETH K. PEEPLES.
BOOK IV.	*By* ELLIS C. PERSING *and* EDWARD E. WILDMAN. *In preparation.*
BOOK V.	*By* ELLIS C. PERSING *and* C. LOUIS THIELE. *In preparation.*
BOOK VI.	*By* ELLIS C. PERSING *and* JOHN A. HOLLINGER. *In preparation.*

BUTTERFLIES OFTEN VISIT THE FLOWERS OF THE LANCE-LEAVED THISTLE.

[*See Chapter* 8.]

NLE
ed.gov

ELEMENTARY SCIENCE BY GRADES

BOOK THREE

A NATURE STUDY AND SCIENCE READER

BY

ELLIS C. PERSING

CHAIRMAN OF THE DEPARTMENT OF SCIENCE IN THE CLEVELAND SCHOOL OF EDUCATION; FORMERLY HEAD OF THE DEPARTMENT OF SCIENCE IN GLENVILLE HIGH SCHOOL, CLEVELAND

AND

ELIZABETH K. PEEPLES

PRINCIPAL IN THE WASHINGTON, D. C., PUBLIC SCHOOLS; FORMERLY SUPERVISING TEACHER OF NATURE STUDY, WASHINGTON, D. C.

U. S. BUREAU OF
EDUCATION
JUL 5 1928
LIBRARY

COLORED ILLUSTRATIONS BY
R. BRUCE HORSFALL

NEW YORK
D. APPLETON AND COMPANY

Copyright, 1928, by
D. APPLETON AND COMPANY

LT
2209
.P4

PRINTED IN THE UNITED STATES OF AMERICA

EDITOR'S INTRODUCTION

The Elementary Science Series has been prepared because of the very earnest belief of the authors in the importance of the subject matter to be covered, in the interests of children in nature about them, and in their ability to profit by a study of it.

Throughout the series the authors have kept in mind the psychology of the child rather than the orderly scientific arrangement of the subject matter. The vocabulary of each book has been most carefully selected from and checked against accredited lists of words of highest frequency in the spoken vocabulary of young children. Moreover, the point of view of the authors is that of explaining to children the everyday world about them and making it an object of interest and profit to them.

Simplicity has been one aim in the preparation of the readers in order that the joy of the subject and the attitudes, habits, and ideals taught by them may not be lost in a maze of mechanical difficulties.

The general aims and objectives throughout the series are those set forth in the *Fourth Yearbook* of the Department of Superintendence.[1] The subject matter of the lessons has been selected with a view of making it possible for teachers to realize those aims and objectives.

The organization of the subject matter of the series agrees in the main with that of the *Fourth Yearbook* course and with other leading courses of study of the country. The course can be articulated with the more formal science course in junior-high-school grades.

---

[1] *Fourth Yearbook,* Department of Superintendence, Ch. IV, ''Elementary Science and Nature Study'' (Washington, National Education Association, 1926), pp. 59-112.

The national policy of conservation of our natural resources is recognized and encouraged among pupils throughout the series. The protection of trees, wild flowers, and birds is specifically taught.

Each volume of the series is organized on the basis of seasons. For example, the study of flowers is increased in the fall and spring months, and minimized in the winter season. The physical sciences are largely taught during the winter months.

Each volume contains the material for a year of instruction. Each volume also carries suggestions to teachers on how to handle the activities; how to obtain materials; plans for field trips; preparation of school gardens, and other aspects of the lessons. Although each volume is a unit in itself, the series represents a unified program of instruction in elementary science and nature study. The series is built on the spiral plan and is progressive in content and style.

At the close of each chapter various suggestions and questions are offered under the heading "Things to Think About." These questions and suggestions are for the purpose of stimulating thought among the children either before or after reading the lesson.

The books are primarily designed as readers with science content for the school systems that have yet made no provision in the curriculum for instruction in elementary science and nature study. New-type tests have been included for the purpose of determining comprehension of the reading assignment.

For the schools that provide for science instruction as such even more important than the comprehension material are the suggestions contained under the title "Things To Do." Since much of the instruction covered in this series of books can be given objectively through the direct contact of children with the objects themselves, the authors of this series have indicated what may be properly done by teachers and pupils in making a study of elementary science more than a book subject. Suggestions of trips to the zoo, excursions to the country, trips to parks and woods, and observations of those activities within the home that are based on scientific principles taught in the books are the various ways suggested of making the instruction covered in this series of books more real and more vital than such instruction acquired exclusively from books.

The material in these books has been successfully tested out before publication under actual classroom conditions, both in schools that used the material primarily as readers and in schools that have permanent provision for instruction in elementary science.

Frank W. Ballou

CONTENTS

PAGE
INTRODUCTION. REAL MAGIC 1
CHAPTER
1. STRANGE INSECT HOUSES 6
2. MOVING DAY IN SEED LAND 12
3. CATERPILLAR MAGIC 19
4. THE MONARCH BUTTERFLY 26
5. OUR SHADE TREES 32
6. BIRDS THAT LIVE IN HOLES 39
7. FALL GARDENING 48
8. A FALL FLOWER OF THE FIELDS AND ROADSIDES . 55
9. THE FRUIT STAND 62
10. A FISHERMAN IN FUR 70
11. CHRISTMAS TREES AND CHRISTMAS GREENS . . 76
12. A BIRD FRIEND OF THE WINTER 82
13. STRANGE WATER FORMS 90
14. A FARM ANIMAL 95
15. THE STORY OF THE THERMOMETER 101
16. ABOUT DOGS 106
17. THE QUEEN'S CHAIR 114
18. THE HUNTER AND HIS DOGS 119
19. CLUCK CLUCK AND QUACK QUACK 124
20. THE SUN'S LIGHT 131
21. THE MAGIC OF MAGNETS 135

CHAPTER PAGE
22. THE CROW 141
23. MAKING ELECTRICITY 149
24. WHISTLES 154
25. THE FROG 160
26. SPRING JOURNEYS OF THE FLICKER 166
27. SPRING WILD FLOWERS 172
28. THE SILK MOTH 179
29. FERNS 188
30. SPRING AWAKENING OF THE TREES 194
31. MORE STRANGE INSECT HOUSES 201
32. ARBOR DAY 210
33. PLANTING AND CARING FOR GARDENS 215
34. HOW WATER INSECTS LIVE 221
35. THE LIFE STORY OF THE CICADA 228
36. ANIMAL COUSINS 233
37. LOOKING FOR REAL MAGIC 239

SUGGESTIONS TO TEACHERS 245
WORD LIST 257
INDEX 263

PREFACE

Elementary Science is the natural means through which a child becomes acquainted with the world about him. Without suggestion or direction some children acquire considerable knowledge of their environment; but more remain pathetically and dangerously blind and deaf to it. For the child's physical, intellectual, and spiritual good the educator should see that he is made aware of the phenomena within his observational scope, and his relations to them.

Elementary science, more than any other subject, supplies actual experience with concrete things. It is, therefore, an ideal study in elementary schools, and may be used as a basis of approach to practically every other subject. Present practice in the teaching of elementary science and nature study in the first six years has indicated the need for a graded series of readers having a science content that will conform generally in subject matter and organization to accepted requirements. It was in the hope of supplying such a need that this series, *Elementary Science by Grades,* has been prepared.

This volume of the series, *Book Three,* has been designed for use in the third grade. In content, it meets the generally accepted subject matter requirements for that grade except for some minor modifications that were made as the result of testing the material in the classroom.

The vocabulary has been based upon the first, second, and third groups of Gates, "A Reading Vocabulary for the Primary Grades'' and upon Thorndike's ''The Teacher's Word Book.'' Words that fall outside of the list of words of highest frequency for the grade have been placed in a list in the back of the book. Many teachers will want to use this list as a source of words for drill before the assignment of the lesson.

Like other books in the series, this volume has been organized on a seasonal basis. Subject matter has been arranged throughout so it will be suitable for the season of the year in which it normally will be studied. In this book, for example, the grasshopper, the spider, the caterpillar, and certain flowers are studied in the fall. The chapters dealing with astronomy and the physical sciences come during the winter months. The latter part of the book, which ordinarily will be studied in the spring, includes chapters on birds, gardening, trees, and flowers.

To test reading ability, different forms of new-type tests have been included at the end of every chapter under the heading, ''Some Things to Think About.'' Some teachers, of course, may desire to substitute other forms or to supplement those that have been prepared. Suggested forms for activities are given under the heading ''Some Things to Do.'' Specific suggestions to the teacher on the teaching of each chapter are placed at the back of the book.

Acknowledgment is gratefully made to Miss Rose Lees Hardy, Assistant Superintendent of Schools, Washington, D. C., to Dr. Paul Bartsch of the Smithsonian Institution, to H. M. Buckley, Assistant Superintendent of Schools, Cleveland, and to W. M. Gregory, Director, Educational Museum, Cleveland, for their advice and comment; to Miss Helen K. Brett, Principal of Alabama School, Cleveland, Ohio, for reading most of the manuscript and for helpful criticisms and suggestions; to Miss

Laura Zirbes, specialist in reading, Teachers College, Columbia University, and Dr. Hanor A. Webb of George Peabody College for Teachers, Nashville, Tennessee, for reading the manuscript and helpful suggestions and criticisms; and to Dr. Edward E. Wildman, Director, Division of Science, Philadelphia, C. L. Thiele, Assistant Director of Exact Sciences, Detroit, and Dr. John A. Hollinger, Director of Nature Study, Pittsburgh, for their helpful advice on the outline, their reading of the complete manuscript, for testing chapters of the manuscript, and for reading the proof.

Mention must also be made of the Washington teachers who tried out the material in their classrooms. These are the Misses M. B. Duffy and N. J. Miller of Petworth School, E. V. Cornell and F. Walther of Hilton School, and E. G. Durnbaugh of Peabody-Hilton School.

The thanks of the authors are also due the various organizations that aided in the gathering of illustrations for the book, especially the American Nature Association publishers of *Nature Magazine,* the Division of Educational Extension of the Department of Agriculture. and the American Museum of Natural History.

E. C. P.
E. K. P.

SHE HAD ONLY A PUMPKIN AND SOME RATS AND MICE.

INTRODUCTION

REAL MAGIC

You have heard the story of Cinderella. Cinderella was a little girl who was very poor. She wanted to go to a ball, but she could not.

She needed a silk dress to go to the ball. She had only a dress of rags. To go to the ball she needed a carriage, horses, and a driver. She had only a pumpkin and some rats and

—AND CINDERELLA WENT TO THE BALL!

mice. Poor little Cinderella! She sat down and cried.

Then her fairy godmother came. She waved her magic wand and wonderful things happened. Cinderella's rags changed to silk. The pumpkin changed into a carriage! The rats and mice changed into a driver and horses, and Cinderella went to the ball!

We call this a fairy story, because it is not true. These things do not happen, but things that are just as wonderful do happen every day. Pumpkins do not turn into carriages.

PUMPKIN SEEDS CHANGED INTO PUMPKINS

Rats do not turn into horses, but if you use your eyes, you will see things happen that are real magic.

Have you ever seen a pumpkin seed? Pumpkin seeds are so small that you could put four or five of them into a thimble. Some pumpkins are so large that you could not lift them. Every year little pumpkin seeds change into big yellow pumpkins. Isn't this as wonderful as it would be for a pumpkin to change into a carriage?

Every year caterpillars change to butterflies. Most caterpillars are not beautiful. Butterflies are very beautiful. Caterpillars have no wings and cannot fly. Butterflies have wings and can fly far. Isn't this as wonderful as it would be for rats to change to horses?

Perhaps you have seen a magician do tricks. Have you seen him take a rabbit out of a hat? You can see something just as wonderful in a chicken yard. Downy little chickens come out of eggs like the one you had for breakfast. Isn't that as great magic as it is to take a rabbit out of a hat?

Did you ever visit a river or lake? Have you seen the water run and ripple? You have seen water run out of the pipe in the kitchen sink. Have you ever seen water get so hard on a cold day that it could not move? Perhaps you held a piece of this hard cold water in your hands. Sometimes that same water goes up into the sky and floats about. After a while it comes back down to earth. Is any magic more wonderful than that?

Have you ever played with a magnet? There are some things the magnet always picks up. There are other things the magnet never picks up. What magic makes the magnet do this?

The world is full of real magic. Things happen every day that are more wonderful than fairy tales. Do you want to see these wonderful things? Then keep your eyes wide open. Keep your mind awake. Read books that will help you find out more about the magic of nature.

SOME THINGS TO THINK ABOUT

1. What did the fairy godmother do to help Cinderella go to the ball?
2. Was this real magic or fairy tale magic?
3. Do you know any real magic?
4. What happens to pumpkin seeds?
5. What happens to caterpillars?
6. What comes out of an egg?
7. How does water change?
8. What can a magnet do?
9. Are these things real magic or fairy tale magic?

CHAPTER 1

STRANGE INSECT HOUSES

Have you ever found little balls on the leaves or stems of plants?

Do you know what they are?

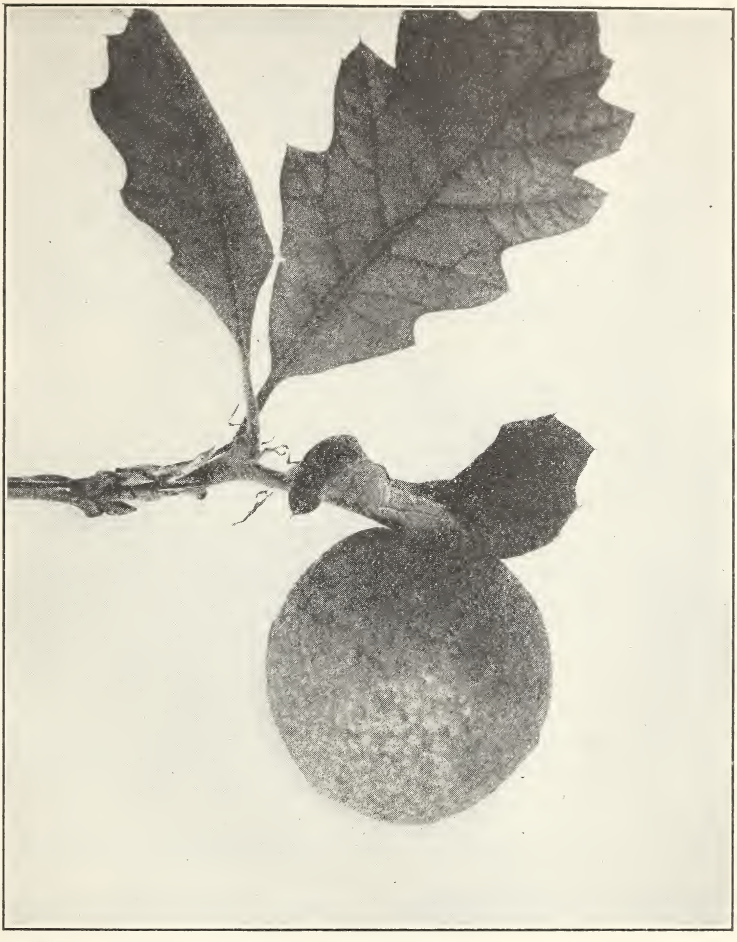
Do you know why they grow on plants?

One day in the fall Billy brought in a strange ball. He had found it on an oak tree. The queer ball was about as large as a marble. It was brown, like the bark on the tree.

Billy wanted to know what it was. It looked very much like a nut, but his teacher knew it was not a nut. She told him that the queer ball was an oak apple.

The oak apple is very different from the apples we eat. The apples we eat are the fruit of the apple tree. Oak apples are not fruit; they are not good to eat.

The oak apple is the home of a little insect.



Courtesy of the U. S. Bureau of Entomology.

THE OAK APPLE IS THE HOME OF A LITTLE INSECT.

The insect is a tiny animal that has wings and looks like a fly.

The mother insect lays an egg in a leaf bud of an oak tree. The egg stays there until it hatches. A little insect comes out and starts to eat the leaf. Then the leaf around the little insect begins to grow into an oak apple.

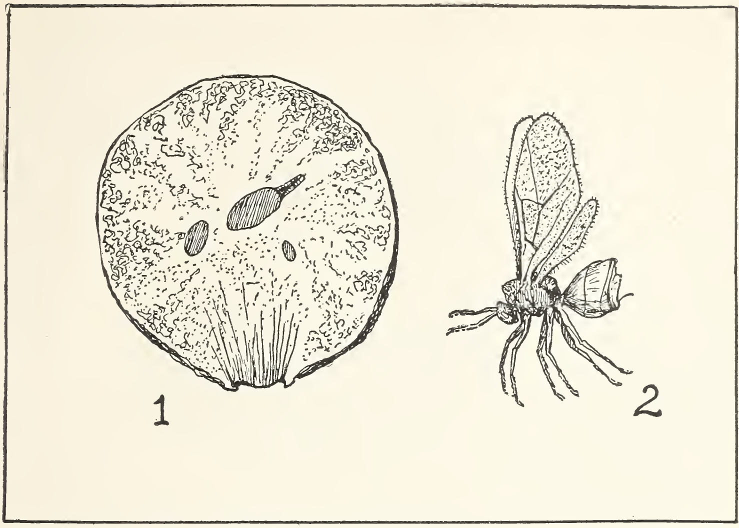
The young insect is inside the queer oak apple house. There is plenty of food in the oak apple, and the young insect eats and grows.

At first the little animal does not look like the father or the mother insect. It looks more like a tiny caterpillar. Then it begins to grow, and, after a while, it changes into a full-grown insect. Then it is ready to leave the oak apple, and it eats a little door in its house and comes out.

This little animal is called a wasp. Later you will learn about other wasps which have different houses.

The tiny wasp is ready to do a trick that the magician cannot do. It is ready to touch another bud and make it grow into a queer little house.

The little balls that the tiny insects use for their houses are called galls. There are many different kinds of galls on plants.

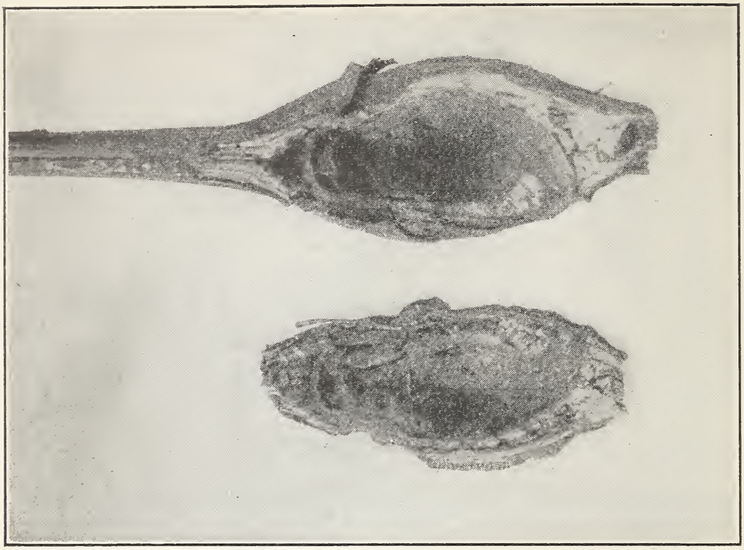


THIS IS THE GALL WASP (2) AND THE GALL CUT OPEN TO SHOW ITS HOME (1).

Sometimes birds and mice open galls. They like to eat the little animals that live inside.

One day the children in Billy's class were picking goldenrod in the field by the school. Some of the children had their eyes open wide. What do you think they saw? They found some more queer balls, but this time they found them on the goldenrod stems.

They knew that the queer balls were galls, and they knew that galls are the homes of tiny animals. The children looked for the door to one of these little houses.



Courtesy of the U. S. Bureau of Entomology.

CAN YOU FIND THE DOOR TO THIS GOLDENROD GALL?

When they found the door, they knew that the insect had left. The teacher cut open some of the queer houses and showed the children the places where the little animals had lived.

The goldenrod stems had made the little houses for the insects.

If you will watch the willow trees, you may find another kind of gall. You will find it growing on the top of the leaf. It is called the willow apple.

All these galls are more wonderful than the tricks done by the magician.

SOME THINGS TO THINK ABOUT

From this list of words find the right word for each row of dots. You will have two words left over.

insect red stems gall brown nut leaves

1. The oak apple is . . . . .
2. A little . . . . . lives in the oak apple.
3. The oak apple is a . . . . .
4. Some galls grow on the . . . . . of goldenrod.
5. Willow apples grow on the . . . . . of the willow tree.

SOME THINGS TO DO

Make pictures of the galls you have read about.

Try to find galls in the fields and woods.

Open some of the galls and try to find the insects.

Make a list of all the plants on which you find galls.

CHAPTER 2

MOVING DAY IN SEED LAND

Did you ever move from one house to another?

Do animals ever move to new homes?

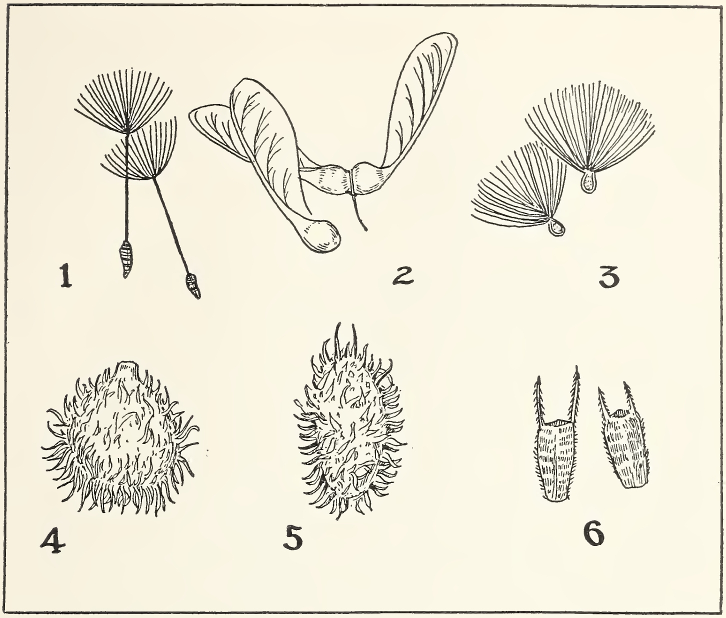
Do plants ever move to new homes?

Perhaps you remember why some seeds must move away to find new homes.

When plants grow too close together, there is not enough room for their roots. The roots cannot get enough food for the plants. There is not enough room for the leaves. The leaves cannot get enough air and sun.

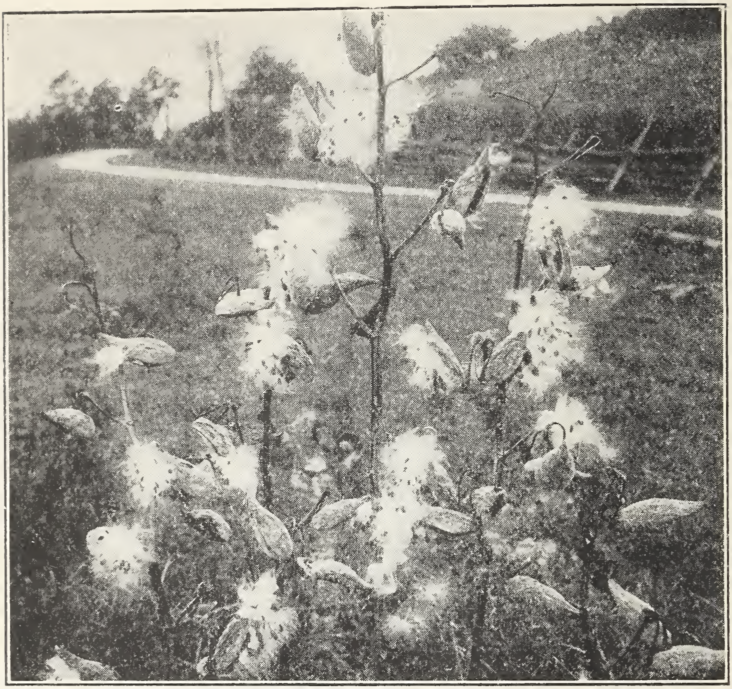
Seeds do not all move the same way. Some are moved by the wind. Some take rides on animals and on people. Others are carried away by birds or squirrels because they are good to eat.

When a dandelion goes to seed its flower



SEEDS TRAVEL IN MANY WAYS.
(1) Dandelion; (2) Maple; (3) Milkweed; (4) Burdock; (5) Cocklebur; (6) Beggar tick.

head turns white. Every little brown seed has a silky white sail on it. Along comes the wind, and carries the seeds away. The wind moves them far away from their old homes. The seeds fall on the ground and grow where there is enough room for new plants. Their roots have enough room and enough food. Their leaves get enough air and sun. It is easy for dandelions to move.

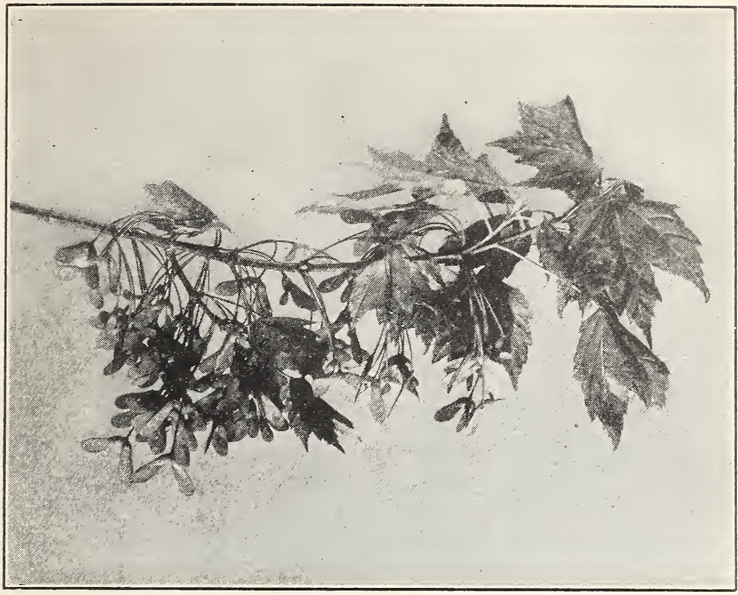


Photograph from J. Horace McFarland Co.

EVERY SEED OF THE MILKWEED POD HAS A BEAUTIFUL WHITE SILKY SAIL ON IT.

There are other plants whose seeds are moved by the wind. One of these plants is the milkweed. Have you ever seen a milkweed pod? When the milkweed pod opens, it is full of brown seeds. Every seed has a beautiful white silky sail on it. The wind moves the seeds to new homes by blowing their silky sails.

Maple trees have seeds with wings on them.

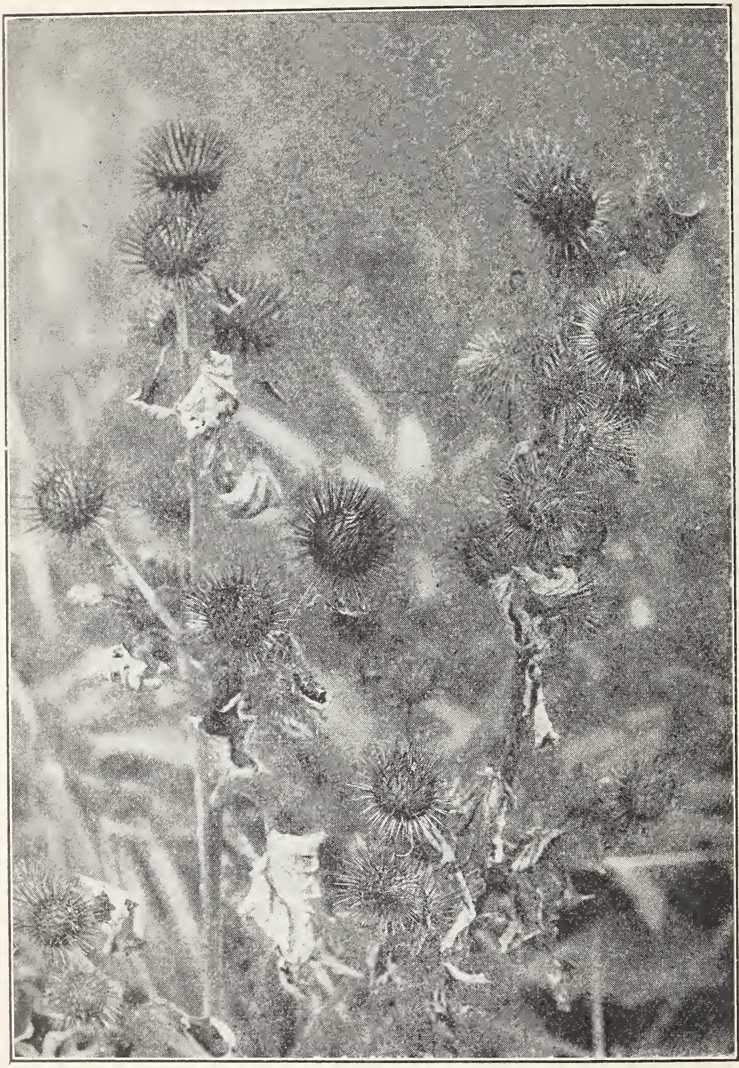


Photograph from J. Horace McFarland Co.

MAPLE TREES HAVE SEEDS WITH WINGS ON THEM.

Each seed has one wing. The wing is part of the outside cover of the seed. It has grown broad and flat, so that the wind can blow it about. The seeds grow in pairs. The picture shows you how they look. They do not travel so far as seeds with silky sails. Because they have wings, the wind can move the maple seeds to new homes. There some of the young maple trees find room to grow.

Did you ever take a walk and find burdocks



Photograph from J. Horace McFarland Co.

THE SEEDS OF THE BURDOCK HAVE LITTLE HOOKS.

sticking to your clothes? The seeds of burdocks have little hooks that hold to anything they touch. They hook on people's clothes. They hook on the hair of dogs, the wool of sheep, or the fur of other animals. They are moved far from their old homes in this way. In their new homes they find enough room to grow.

Other seeds with hooks are moved by people and animals, too.

Some seeds have parts that are good to eat. Berries have seeds with parts that are good to eat around them. Nuts are seed-fruits that are good to eat. Birds eat berries, and drop the seeds far away from the place where the berries grew. Squirrels carry nuts away and hide them in the ground. Some of these nuts the squirrel digs up and eats, but others grow. In this way seeds that are good to eat are moved to new homes by birds and animals.

Think how many plants there are out of doors. Think how many seeds there are on every plant. The wind moves some by their wings or by their silky sails. People and animals move some because the seeds hook fast to them. Birds and animals carry others away because they are good to eat. Do you think these are good ways for seeds to move?

SOME THINGS TO THINK ABOUT

Here is a word game for you to play. Take a piece of paper and draw two lines on it to mark off spaces for three lists of words. At the top of each space write what the list is about. Your paper should look like this.

Flying Seeds	Sticking Seeds	Seeds That Are Good to Eat

Here are twelve words. Put each one in the list where it belongs.

berries
burdock
wing
hook
nuts
clothes
sail
dog
birds
dandelion
squirrels
wind

SOME THINGS TO DO

Gather as many kinds of seeds as you can find, and bring them to school. Put the flying seeds in a box. Put the sticking seeds in another box. Put seeds that are good to eat in another box.

Write down all the ways you know in which seeds move to new homes. Write a story about "Moving Day in Seed Land."

CHAPTER 3

CATERPILLAR MAGIC

What kinds of caterpillars do you know?
Where do you find them?
What do they do?

Last spring perhaps you saw caterpillars wake up. They had been asleep all winter. They were not caterpillars any longer. They had changed to moths or butterflies.

Mother butterflies lay eggs. The eggs are very small. They are often stuck fast to the under side of a leaf.

Little caterpillars hatch out of butterfly eggs. There are some plants that the little caterpillars like to eat. There are many plants they will not eat. The mother butterfly lays her eggs on the kind of plant that the little caterpillars will like.

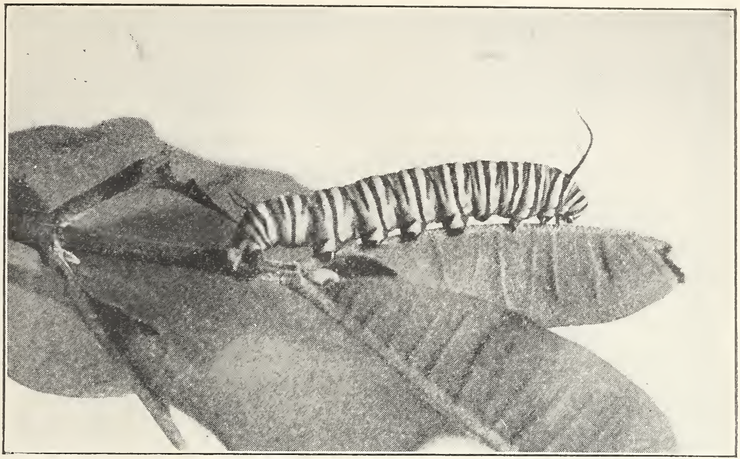
There is one kind of mother butterfly that

Photograph by L. W. Brownell.

THIS MONARCH BUTTERFLY WILL LAY EGGS FROM WHICH WILL COME LITTLE CATERPILLARS.

always lays her eggs on the milkweed plant. She is called the monarch butterfly. Her little caterpillars will like to eat the leaves of the milkweed.

A little milkweed caterpillar hatches out of each egg that the monarch butterfly lays. The



Photograph by L. W. Brownell.

THE MILKWEED CATERPILLAR IS VERY GAY IN THE COLORS IT WEARS.

little caterpillars are very hungry. They eat day and night.

Each young caterpillar grows fast. Soon its skin is too tight. Then the old skin splits down the back. When the caterpillar's skin splits, the caterpillar comes out in a new skin. The caterpillar is larger than it was before. The new skin is larger than the old skin out of which it came. Isn't that magic?

This happens several times before the caterpillar is as large as it grows to be.

It will take you twenty years to grow up, but a milkweed caterpillar grows up in about two weeks. When it is grown up, it is about two inches long.

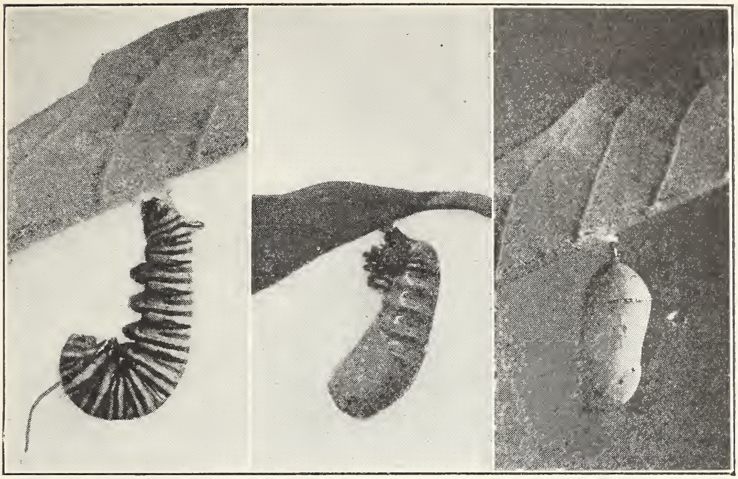
The milkweed caterpillar is very gay in the colors it wears. It is white with yellow and black stripes around it. Back of its head are two long black threads. Near the other end of its body are two more long black threads. When the caterpillar crawls, these threads wave. The threads are like little whips. They frighten away the caterpillar's enemies.

If you have sharp eyes, you will see that the caterpillar's body is not all in one piece. It is made of many rings. Can you count the rings on a milkweed caterpillar?

The caterpillar has six legs near its head. Near the other end of its body are eight more legs. On the very last ring of the caterpillar's body there is another leg. Are all these legs alike? Look and see.

Look for the caterpillar's eyes. Look at its mouth. When the milkweed caterpillar eats, its jaws move sideways. Do yours, when you chew?

Are your eyes sharp enough to see some little holes along each side of the caterpillar?



Photograph by L. W. Brownell. Courtesy of "Nature Magazine."

FIRST IT FINDS A SAFE PLACE TO SLEEP

THE OLD SKIN FALLS OFF

THE CHRYSALIS IS PALE GREEN WITH GOLD SPOTS ON IT

It breathes through these little holes on his body.

After the milkweed caterpillar is grown, it gets ready to go to sleep. First it finds a safe place to sleep. On the under side of a fence rail, or a leaf, it spins a little mat of silk. The silk comes out of the caterpillar's lower lip. It holds tight to this silk mat, while its skin splits for the last time. Then the old skin falls off.

This time a caterpillar does not come out.

Instead, there is a little bundle hanging to the fence rail or the leaf. We call it a chrysalis. The chrysalis is the cover inside of which the caterpillar sleeps.

The monarch chrysalis is very beautiful. It is pale green with gold spots on it.

This is caterpillar magic. Do you think a magician could do a trick like it?

You can see caterpillar magic out of doors if you have sharp eyes. You can see it in your own schoolroom if you will make a caterpillar cage and bring some milkweed caterpillars to school.

You will need a big, wooden box with wire netting over the top and one side. Put some earth in the bottom of the box. Put a jar of water in one corner to hold the milkweed leaves the caterpillar likes to eat. Be sure to keep fresh milkweed leaves in the jar.

SOME THINGS TO THINK ABOUT

Find the parts of this story that tell about the pictures. With what sentence does each part begin? With what sentence does each part end?

SOME THINGS TO DO

Bring milkweed caterpillars to school.

Bring other kinds of caterpillars to school, and put them in the cage. Watch them.

Watch to see a milkweed caterpillar change to a chrysalis.

Think of some of the things a caterpillar has to help it get along in the world.

Find a monarch chrysalis. Bring it to school. Watch it every day.

CHAPTER 4

THE MONARCH BUTTERFLY

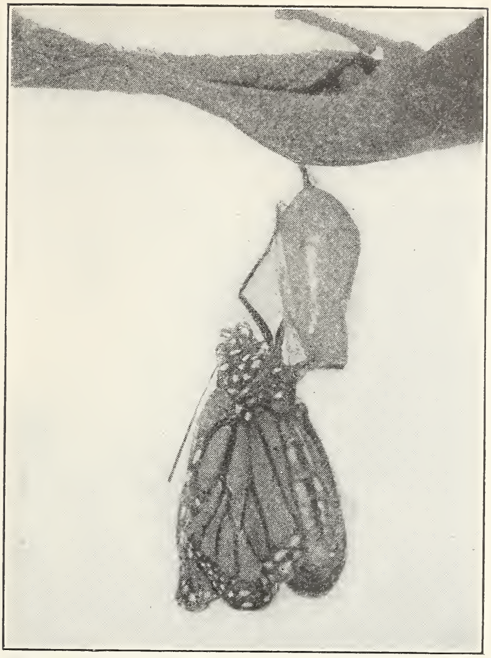
How many butterflies have you seen this week?
What colors did they wear?
What were they doing?

The pale green monarch chrysalis with its gold spots is very beautiful, but it is not as beautiful as what comes out of it.

For about twelve days the chrysalis keeps turning darker green. It almost always hangs near green leaves. This makes it hard to see. At the end of the twelve days the chrysalis opens, and a monarch butterfly comes out.

Monarch means king. The monarch butterfly is so beautiful that people call it the king of butterflies. That is what its name means.

Like other butterflies, the monarch cannot



Photograph by L. W. Brownell. Courtesy of "Nature Magazine."

THIS IS A CATERPILLAR WAKING UP IN THE SPRING

fly when it first comes out of its chrysalis. Its wings are crumpled and folded together. It hangs for a long time by its feet to the chrysalis, or to the nearest leaf. While it hangs there, it fans open its wings. There are two front wings and two hind wings.

The monarch's wings are very gay. They are red-orange with black borders. There are white dots in the black borders of the wings.

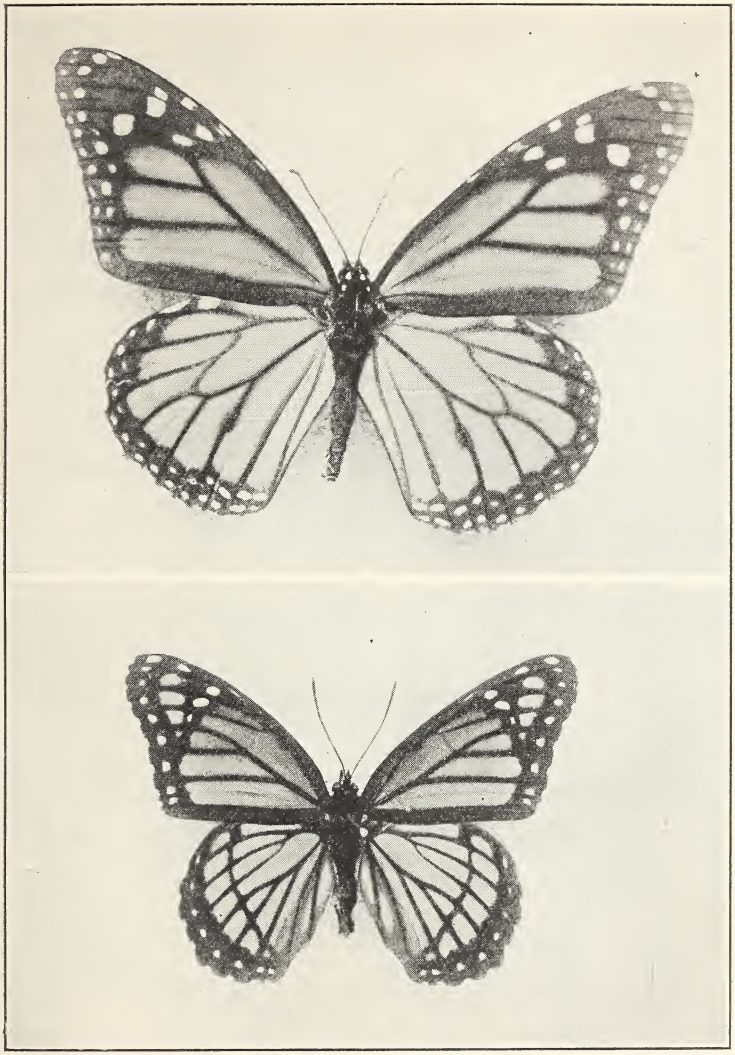
The father monarch has little pockets on each hind wing. There is perfume in the pockets. He wears his perfume pockets to please the mother butterfly.

When the monarch rests on a flower, it holds its wings straight up over its back. The top sides of the wings come together over the butterfly's back. You cannot see them. You can see the under sides of the wings.

The under side of the monarch's wing is pale yellow. It is not as easy to see the monarch when it rests as it would be if the red-orange side of the wings showed. This is one of nature's tricks to take care of the monarch.

The monarch has six legs, like all other insects. Its body is black with some white spots on it.

Butterflies do not eat much food. The monarch drinks the sweet juice that is in flowers. Perhaps you have tasted this sweet juice in flowers like the honeysuckle. The monarch has a very long tongue to reach the juice.



Courtesy of the American Museum of Natural History.

THE TOP BUTTERFLY IS THE MONARCH. THE LOWER ONE IS THE BUTTERFLY THAT WEARS THE COLORS OF THE MONARCH.

Birds do not like to eat monarch butterflies. We do not know why. The monarch flies as slowly as it likes. Most butterflies fly this way and that to get away from birds.

There is another butterfly that wears the same colors as the monarch. The birds think it is a monarch and will not eat it.

You have seen the birds go away in the fall to warmer places. Monarch butterflies do the same thing. Large flocks of them go south in the fall.

In the spring the monarchs come back as soon as the milkweed begins to grow. The mother monarch must have milkweed plants on which to lay her eggs. Do you remember why?

A monarch butterfly is not always a butterfly. Like a magician, nature changes it into different things. First it is an egg. Then it is a little caterpillar. After that it is a chrysalis, and last of all it is a butterfly.

SOME THINGS TO THINK ABOUT

Find a sentence that tells

1. whether you will see monarch butterflies out of doors in winter.
2. how the father butterfly tries to please the mother butterfly.
3. how the monarch's wings look when it comes out of the chrysalis.
4. how the monarch's wings look when it flies.
5. how the monarch gets a drink of sweet juice from the honeysuckle.
6. how many monarch butterflies the birds eat every year.

SOME THINGS TO DO

Watch for flocks of monarchs that may be going south.

Make a butterfly net and catch some butterflies.

Put them in the insect cage.

Make pictures of them.

Let them go again.

CHAPTER 5

OUR SHADE TREES

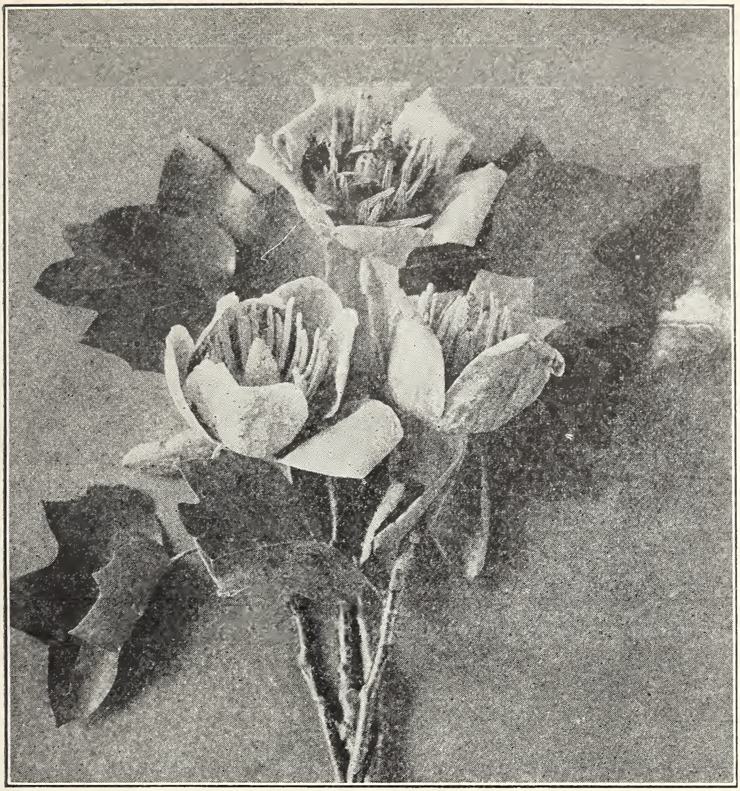
What kind of trees have you seen on your street?

What kind of shade trees do you have at your school?

Have you ever planted the seeds of these trees?

There are some trees that we plant to make cool shadows for us in the hot summertime. Such trees are called shade trees. People plant shade trees along their streets and in their yards and parks.

In the summer children like to play under the shade trees. Many people like to sit and read under the shade trees in the parks. Most boys and girls like to have their picnics under shade trees in the parks or along the road.



Photograph from J. Horace McFarland Co.

THE FLOWER OF THE TULIP TREE IS LARGE AND BRIGHT

The Tulip Tree

The tulip tree is a beautiful tree for city parks. In the forest where it has many other trees around it, it has a small top, but when it is planted in yards or parks it has spreading branches and many leaves. Good shade trees have many branches and leaves.

The tulip tree grows very tall and straight. Almost always it has beautiful bark. The old bark is brown with long deep marks in it. The bark on the young twigs is gray and shiny.

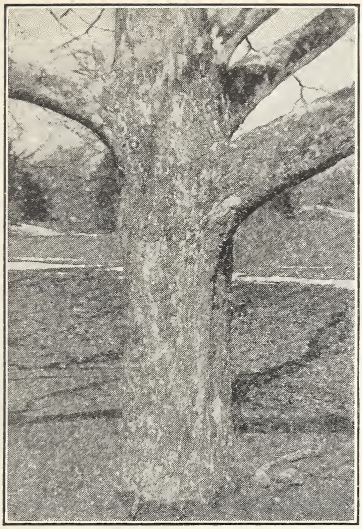
The leaves look just like the picture on page 33. When you see such leaves on a tree, you may be sure it is a tulip tree. Only sharp eyes will see the leaves on very tall trees.

The flower of the tulip tree is large and bright. It is greenish yellow with spots of orange. The flower looks a little like a tulip. You will find the flowers on the tulip tree in May.

The fruit of the tulip tree is growing all through the summer. By fall it is ripe and has many seeds. Sometimes the fruit stays on the tree long into the winter.

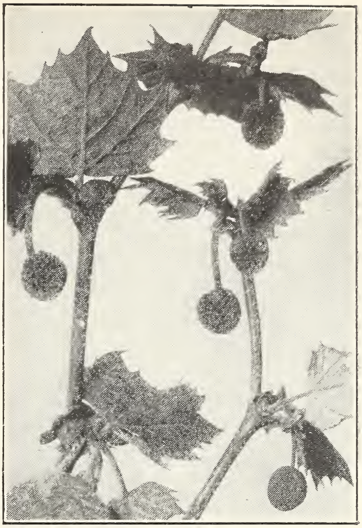
The tulip tree grows best in deep rich ground with enough water.

The wood from this tree has a greenish color. It is used to build houses and boats. Wood from tulip trees is sometimes used to make paper.



Photograph by L. W. Brownell.

THE OLD BARK OF THE TREE COMES OFF EACH YEAR.



THE FLOWERS OF THE SYCAMORE ARE TINY AND RED.

THE SYCAMORE TREE

Another tree that is sometimes planted in the city is the sycamore. The bark of the sycamore is different from the bark of the tulip tree. The old dirty bark of the sycamore comes off each year. Then the new clean bark makes the tree look as if it had been painted white.

Some of the old bark stays on the older branches. Then there are spots of white and brown. This makes it easy to know the sycamore tree, not only in summer but in winter, too.

The leaves are bright green in summer, but in the fall they change to brown. Then they fall to the ground.

The flowers of the sycamore tree are tiny and red. You may see them on the trees in May.

Sometimes the fruit hangs on the sycamore tree all winter. The fruit is a brown ball about as big as a walnut. In this ball are many seeds.

The Red Maple Tree

Another tree that is often planted to give us shade is the red maple. Red maple is a good name for it, as you will see.

Most of the red maple trees have leaves like those in the picture on page 15, but some have different leaves. In the fall the leaves change from green to red.

The flowers of the red maple tree are red. They come out on the tree very early in the spring. They come out before the leaves, and they make the whole tree look red.

Photograph from J. Horace McFarland Co.

THE FLOWERS OF THE RED MAPLE TREE ARE RED.

In the picture with the leaves on page 15 you can see the fruit of the red maple. The color of the fruit is red and brown. The maple fruit is called a key. Of what use to the maple fruit are the wings?

Maple wood is used for the desks and seats in schools. Many floors in our houses are made of maple wood. There are many other uses for this wood because it is hard and strong.

SOME THINGS TO THINK ABOUT

From this list of words find the right word for each row of dots.

white bright brown key shade tall

1. People plant . . . . . trees along the street and in their yards.
2. The tulip tree grows very . . . . .
3. The tulip tree has . . . . . flowers.
4. The new bark of the sycamore tree is . . . . .
5. The fruit of the sycamore tree is a . . . . . ball.
6. The maple fruit is a . . . . .

SOME THINGS TO DO

Get leaves and fruit of the three trees in this story.

Draw pictures of the trees and of their leaves.

Draw pictures of other trees near your home that are used for shade.

CHAPTER 6

BIRDS THAT LIVE IN HOLES

Do you know any birds that make nests in holes?

Why do you think some birds are called woodpeckers?

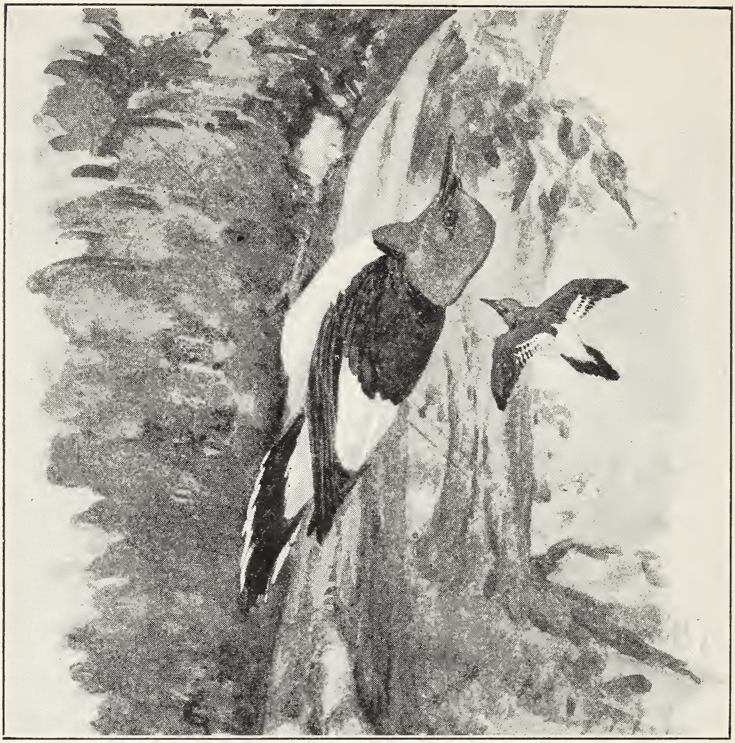
Why do you think some are called kingfishers?

Most birds build nests in trees or bushes or in the grass. They gather twigs and grass and any soft things they can find, and make them into nests for their little ones.

There are some birds that make their homes in holes. They can dig out holes in trees or in the earth. They have their nests in the holes they have dug.

The Red-Headed Woodpecker

Red-headed woodpeckers build their nests in holes.



From a drawing by R. Bruce Horsfall

THE WOODPECKER'S BILL IS GOOD FOR DIGGING OUT HOLES IN DEAD TREES.

The red-headed woodpecker is different from other woodpeckers. Most woodpeckers have some red feathers on their heads. The red-headed woodpecker's head is red all over. It has a red bib, too. Both the father and mother have this gay bonnet and bib. Black and white are the other colors on their bodies.

Soldiers sometimes have a drummer boy. The woodpecker is the drummer among the birds. When he wishes to call his mate, he drums on a dead branch. Most other birds sing to call their mates. Sometimes the woodpecker drums on a telegraph pole. He may even drum on a tin roof. His strong bill makes a good drumstick.

The woodpecker's bill is also good for digging out holes in dead trees. In these holes the woodpeckers make their nests. The nest of a woodpecker has no soft grass or feathers in it, like other birds' nests. There is sawdust in it. On this sawdust mother woodpecker lays her white eggs. There are four, five, or six of them.

Mother woodpecker keeps the eggs warm under her until the young birds hatch out. This takes two weeks. Then the old birds are very busy feeding the young ones. They raise only one family each year.

Young birds need soft food. They like to eat insects. Redheads catch insects on the wing. That means that the birds fly after insects while they are in the air and catch them. Young woodpeckers eat some fruit, too.

The old woodpeckers like to eat nuts. They like acorns, the fruit of oak trees, and beechnuts, the fruit of beech trees.

It is wonderful to see how the woodpecker's feet and tail help it in its work. It has large feet. The toes are very long, with strong claws like hooks. Two toes turn front, and two turn back. With these strong toes the woodpecker holds to the tree while it drums or digs out its nest.

The feathers of the woodpecker's tail are not like the feathers of other birds' tails. Each feather ends in a stiff point. The feathers of most other birds' tails are soft and round on the ends. The stiff points on the woodpecker's tail help to prop the bird against the tree while it works.

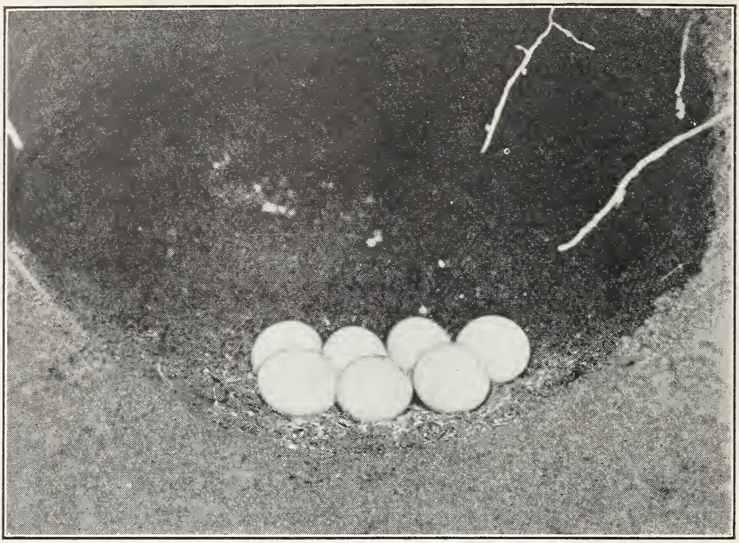
If redheads can store up enough food for winter, they spend the cold winter in the north. If they cannot, they go south, where they can find more to eat.

Photograph by L. W. Brownell. Courtesy of "Nature Magazine."

THE KINGFISHER'S NEST IS A HOLE IN THE BANK OF A STREAM.

A FISHERMAN IN FEATHERS

Another bird that makes its nest in a hole is the kingfisher. The kingfisher's nest is not in a hole in a tree, but in the bank of a stream. The hole runs back into the bank several feet. At the end is a round place for the nest. Sawdust is a strange pillow for little woodpeckers, but little kingfishers have a pillow that is stranger. It is made of fish



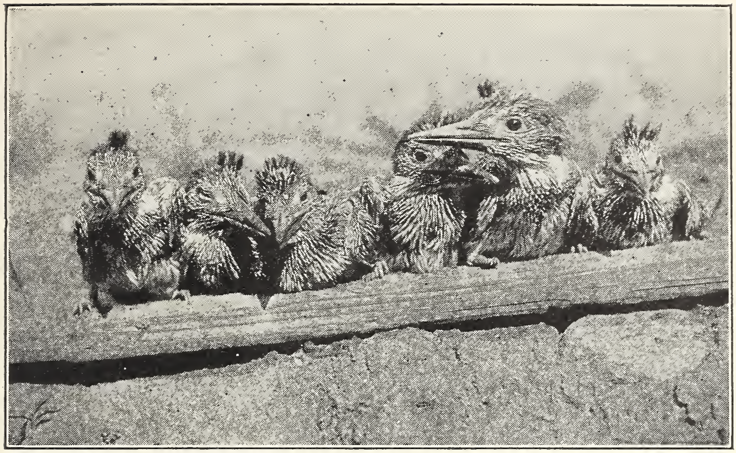
Photograph by L. W. Brownell. Courtesy of "Nature Magazine."

FAR BACK IN THE BANK IS THE NEST.

bones! That is not a soft pillow for the little kingfishers, but they like it.

Sometimes there are eight young kingfishers in a brood. Brood is the word for a bird family. The mother and father bring fish to the nest for the young birds to eat.

When the young kingfishers are old enough to move about, they come to the door of the nest to get the fish. Only one young bird can be fed at a time, but they all come crying for food.



Photograph by L. W. Brownell.

THESE BABY KINGFISHERS MAKE THEIR BED UPON FISH BONES.

The old birds call the little ones by making a sound like a baby's rattle. It is not a sweet sound, but the little kingfishers like to hear it. It means that their dinner is on its way.

The father kingfisher does most of the fishing. He sits very still on the branch of a tree that hangs over the stream. His bright eyes look deep into the water for fish. The moment he sees one, he dives for it. He drops straight down like a stone and catches the fish with his long, strong bill. Then he flies up to a tree and beats the fish to death against a branch. When the kingfisher eats a fish, he swallows it head first to keep the fish's fins and scales from hurting his throat. Isn't that a good trick?

Red-headed woodpeckers are about as large as robins, but kingfishers are larger. Kingfishers' heads and backs are a beautiful blue-gray color. Their throats and breasts are white. The father bird has a blue band, or belt, across his breast. The mother bird has a brown belt. They are called belted kingfishers because they have these bands of color on their breasts. On their heads they have long feathers that they can lift up to form a crest.

When ice freezes over streams in winter, kingfishers cannot stay in the north because they cannot catch fish. They go south to get food.

SOME THINGS TO THINK ABOUT

Here are two beginnings for sentences, and here are ten endings. Put each ending with the beginning to which it belongs.

Beginnings

1. The red-headed woodpecker
2. The kingfisher

Endings

makes its nest in a bank.
has very large feet.
lays its eggs on fish bones.
likes acorns and beechnuts.
has a red bib.
catches fish.
drums on trees.
makes a sound like a rattle.
has a crest on its head.
feeds insects to its young birds.

SOME THINGS TO DO

Find stories and pictures of redheads and other woodpeckers.

Find stories and pictures of kingfishers.

Make pictures of the two birds you have read about.

Try to see them out of doors before they leave for the winter.

CHAPTER 7

FALL GARDENING

Did you have a garden last summer?

What work must be done in a garden in the spring?

What work must be done in a garden in the summer?

Making a garden is work, but it is fun, too. There are many things to do in a garden in the spring when it is time to plant the seeds. Perhaps you know what some of them are. There is also work to be done in a garden in the summer, when all the plants are growing and when they need water and room and sun to grow.

When the fall comes, there are still many pleasant things to do in a garden. In a vegetable garden, the vegetables are ready to be gathered and put away for the winter. In a flower garden, the plants that spend the winter in our houses are ready to be moved. In either kind of garden, seeds are ready to be picked and put away for next year's garden.

In the fall, vegetables that we want to use must be taken out of the garden before the weather becomes too cold for them. Frost and cold weather kill plants.

Onions, beets, carrots, potatoes, and cabbages are some of the vegetables that are ready to be gathered in the fall. The onions should be pulled after their leaves are dead. They should be left in the sun to dry for a few days. Then if they are put in a cool place where they will not freeze, they can be kept for the winter.

Potatoes in the garden should be dug in the fall after the potato vines are dead. When they are dug up, they must not be left in the sun. The sun turns potatoes green. If you have never seen a potato turn green, try it. Put a potato that has just been dug out in the sun for a few days. What happens?

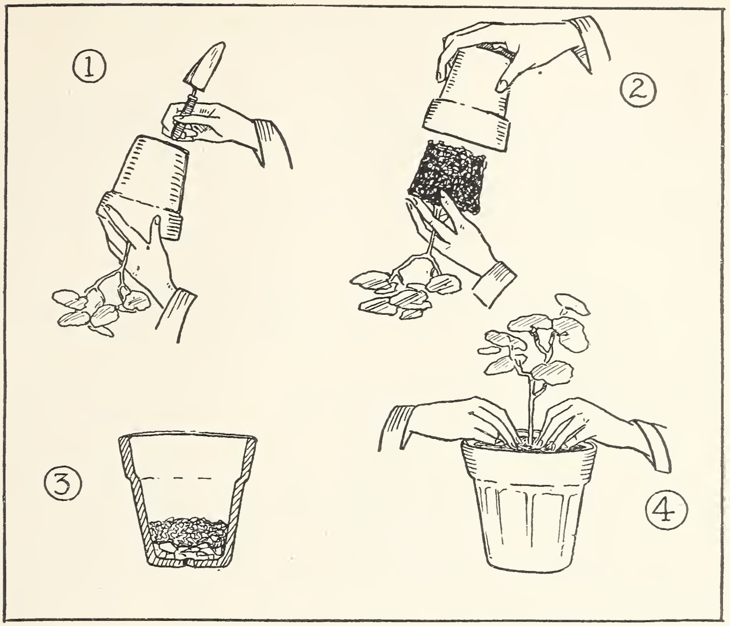
Beets and carrots can be kept during the winter in boxes of sand in the cellar. Carrots can be kept under the ground out of doors. They should be placed on some straw in a hole and covered with straw and earth.

Cabbages must be pulled before the first frost comes. They also can be kept in a box in the cellar. Sometimes people dig a ditch out of doors and put straw in it. They put the cabbages in the ditch and cover them with earth. The heads of the cabbages must be put down in the ditch. The roots are left above the ground.

There are other ways to keep vegetables for the winter. Perhaps you know some of them.

In the fall, some of the plants in our flower gardens must be given winter homes. Some plants have bulbs that must be dug up and put away in the cellar until spring comes again. Some of the plants must be planted in flower pots and taken into the house before the frost comes.

Geraniums are good plants to take into the house for the winter. They should be planted in flower pots that are big enough to let the plants' roots grow. This is the way to plant them in flower pots.



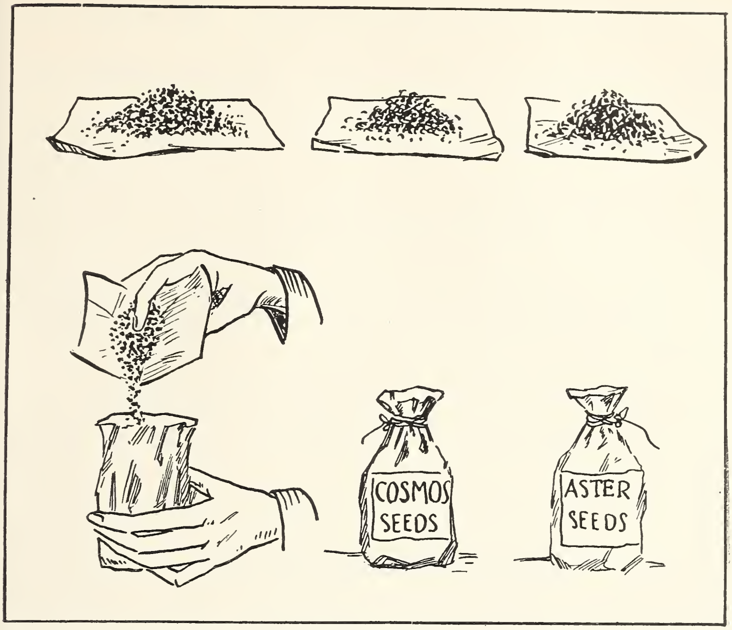
HOW TO TRANSPLANT GERANIUMS.

Water the plant about two hours before you take it up. Cover the bottom of the flower pot with small stones, and then put about an inch of soil over the stones. Take up the plant with a spade, and try very hard to keep some soil around its roots. Never pull the plant up. Put the plant in the flower pot with the soil still around the roots. Then put fine, rich soil in the pot around the plant. After the geranium is planted in the pot, water it again.

Sometimes a plant grows too large for its flower pot. Then it should be moved to a larger pot. The plant should be watered about two hours before it is moved, and the larger pot should have stones and soil in the bottom just as the geranium pot had. The flower pot that has the plant in it should be tapped several times to loosen the soil from the side of the pot. Then the plant can be lifted out with all the soil around its roots and put in the larger flower pot. The larger pot should be filled with good soil and the plant watered.

In either a vegetable garden or a flower garden, seeds are ripe in the fall. The ripe seeds should be gathered and saved to plant next year. The ripe seeds should be gathered and dried. The seeds of two kinds of plants should not be mixed.

When the seeds are dry, the seeds of each kind of plant should be put in a bag. If there are aster plants and cosmos plants in the garden, the aster seeds should be put in one bag and the cosmos seeds in another. The name of the plant from which the seeds were taken should be written on each bag.



WHEN THE SEEDS ARE DRY, THE SEEDS OF EACH KIND OF PLANT SHOULD BE PUT IN A BAG.

The seeds of vegetables should be kept the same way. Watch for plants that have "gone to seed." Radishes and onions will have seeds if the plants grow long enough. The lettuce plant grows seeds, too. When the lettuce plant is "going to seed," it unfolds its big, leafy bud and grows tall. The leaves grow on a tall stalk. Then the plant blooms and the seeds form. Lettuce plants have tiny, gray seeds.

Gardening in the fall is fun. We find out many strange things about plants when we work in our gardens in the fall.

SOME THINGS TO THINK ABOUT

1. Tell two ways to keep carrots for the winter.
2. Tell two ways to keep cabbages for the winter.
3. Tell how to plant a geranium in a pot.
4. Tell how to save seeds for next year's garden.

SOME THINGS TO DO

Make a list of all the vegetables you grew in your garden.

Make pictures of vegetables from your garden.

Tell how you took care of your garden in the summer.

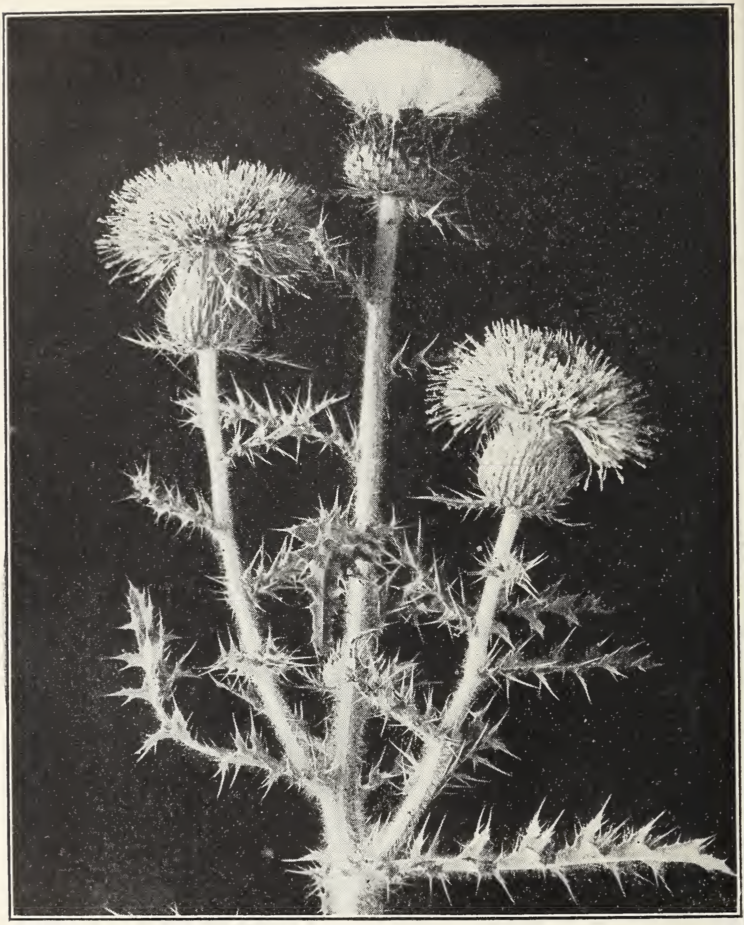
CHAPTER 8

FALL FLOWERS OF THE FIELDS AND ROADSIDES

What is a weed?
What do you know about thistles?

There are some flowers growing in fields and along roads that are as beautiful as garden flowers. One of these is the thistle. We call it a weed because it grows where it is not wanted, but it is a beautiful plant.

Long ago soldiers carried lances. A lance has a long handle with a sharp point, like a knife, on one end. The lance-leaved thistle gets its name from its leaves. They have many points, and every point ends in a sharp spine. A spine is a long sharp point. These spines are like soldiers' lances. No matter how you try to touch a thistle, one of the spines pricks you. Some point up. Some point down. Some point sideways. The thistle is as safe



Photograph by L. W. Brownell.

THE THISTLE IS AS SAFE FROM ENEMIES AS A SOLDIER WITH HIS LANCE.

from enemies as a soldier with his lance. Can you tell why?

The dark green leaves of a thistle grow on a strong stem. This stem is not like the stems of most flowers, for it feels as if it were made of wood.

The lance-leaved thistle has beautiful flowers. Those at the top of the stem bloom first. The flowers are purple. They stand in a deep green cup on which are many sharp spines. The flowers smell very sweet, and have nectar in them for bees, butterflies, and other insects. Nectar is the sweet juice of flowers. Insects like the thistle flowers for their color, their nectar, and their sweet smell.

Here is something worth finding out about the thistle flowers. Each flower head, instead of being one flower, is a bunch of tiny flowers. The thistle makes more seeds by having many little flowers in bunches.

Each little flower has a seed box. Every little flower also has pollen. Pollen is the magic dust that makes seeds grow. The seeds in the seed box will never grow unless they get some pollen. They do not want the pollen from their own flower. They must have pollen from another thistle flower. Who do you think brings it to them?

The bees, butterflies, and other insects get pollen on their legs and bodies when they visit a thistle to get a drink of nectar. Then they go to another thistle for more nectar, and some of the pollen falls off the insects. It falls down on the seed boxes of the little thistle flowers, and seeds begin to grow.

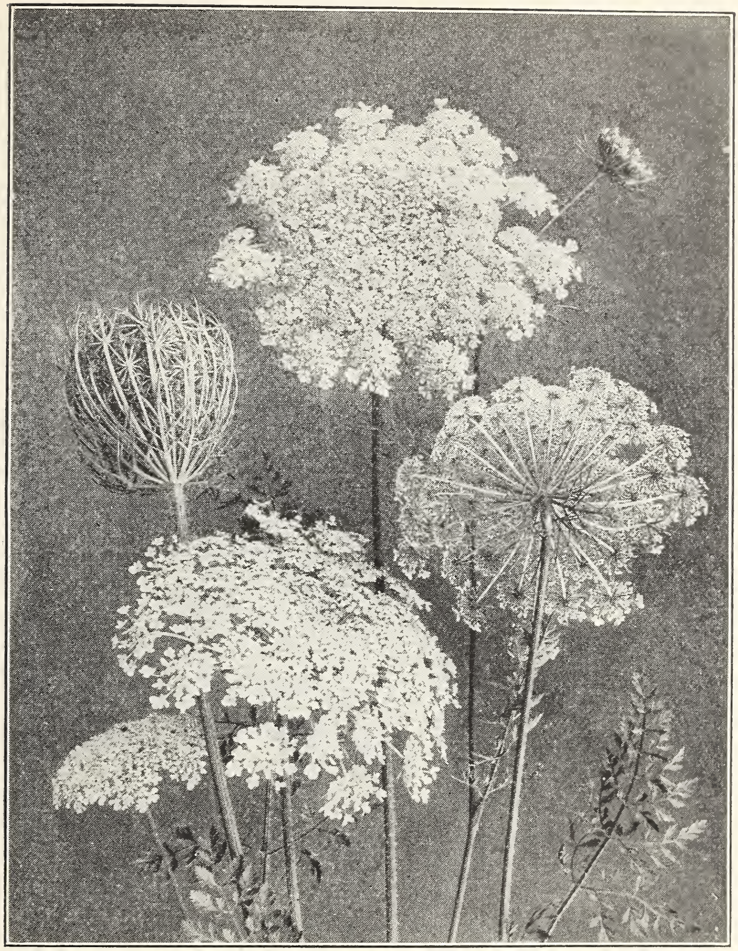
Most pollen is yellow. The pollen of the lance-leaved thistle is white.

When the seeds are ripe, they are brown. Each one has a sail of white silk fastened to it. The purple part of the flowers is gone. The thistle head is white and brown now.

The wind carries the seeds by their silk sails to find new homes. When a seed drops into the ground, it begins to grow to make a new thistle plant. There are many thistle plants because each thistle flower makes many seeds.

There is another reason why there are so many thistles. Their many spines keep people from picking the flowers, and animals from eating the plants. Their lances keep the thistles safe.

There are many other fall flowers. In the fields and along the roads there is a beautiful



Photograph from J. Horace McFarland Co.

CAN YOU SEE WHY THIS IS CALLED QUEEN ANNE'S LACE?

white one that looks like lace. It is called Queen Anne's lace.

In gardens you will find phlox and a bright red flower called salvia. See if you can find them. Bring a piece to your teacher to see whether you are right.

SOME THINGS TO THINK ABOUT

Here is another good game. On one side of the page you will find several words that tell about something, and on the other side the name of the thing about which they tell, like this:

a plant with sharp spines	thistles

Take a piece of paper, and write the right word beside the words that tell about it. You will have two words left over.

1. the sweet juice of flowers
2. magic dust that makes seeds grow
3. visitors that carry pollen
4. a plant that grows where it is not wanted
5. a wildflower that looks like lace
6. a brown bundle from which a plant grows

Queen Anne's lace
weed
leaves
seed
nectar
flower
lance
insects
pollen

SOME THINGS TO DO

This book tells you these things about the thistle:

1. How it looks
2. Where it grows
3. How it makes its seeds

Find out these things about Queen Anne's lace, phlox, and salvia.

CHAPTER 9

THE FRUIT STAND

What fruit do you like best?
What fruits grow on trees?
What fruits grow on vines?

At the fruit stand there are many kinds of fruits. There are fruits that grew on farms near by, and fruits that grew hundreds of miles away.

There are fruits of many colors on the fruit stand. There are shiny red, yellow, and green apples. There are pink and yellow peaches with soft, fuzzy skins. There are blue, yellow, and red plums with smooth skins. There are oranges of the color that has been named for them. There are big green watermelons. If you look at the fruit stand next time you go by one, you will see all of these colors and more.

Photograph from J. Horace McFarland Co.

WHERE EACH APPLE IS, THERE WAS ONCE A BLOSSOM.

Fruits grow from flowers. If you will take an apple and look at the end away from the stem, you will see some parts of the apple flower. They will be dry and brown. Peaches and plums and oranges and watermelons grow from flowers, too, but you cannot see dry flower parts on them.

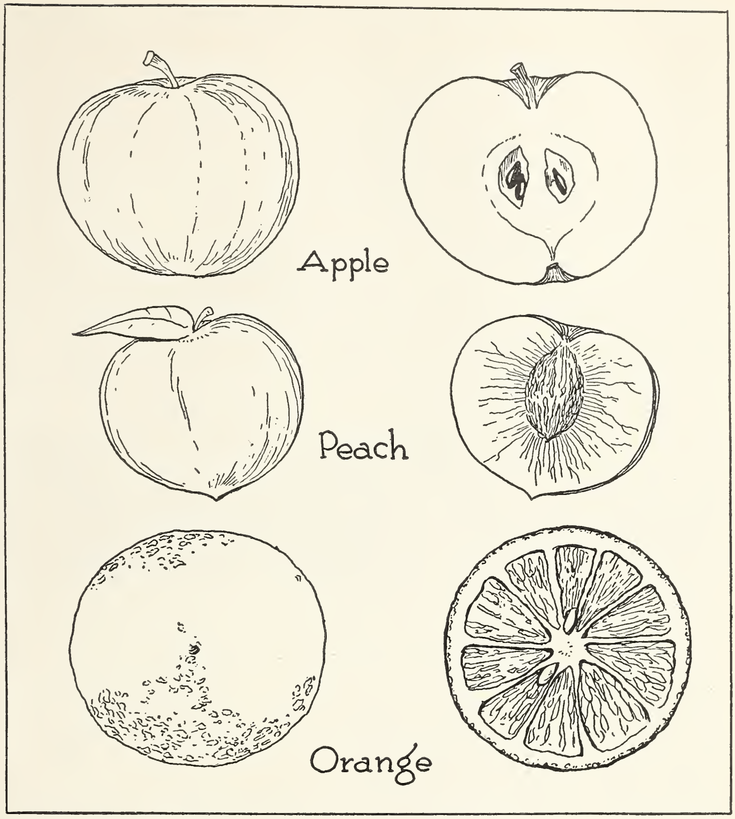
The fruit of a plant usually has seeds in it. The seeds will make new plants if they are planted in the right kind of soil and have the right kind of weather.

The seeds are often in the middle of the fruits. The sweet part around the seeds is the part we eat. It is called the flesh of the fruit.

When you eat an apple, you throw away the middle part that has the seeds in it. This part is called the core of the apple.

If you will cut an apple core in two, you will see the seed boxes in the middle, and each seed box usually will have two seeds in it.

Peaches and plums are not like apples. They do not have cores in them. Each peach and each plum has one big, hard seed in the middle of it. Such big seeds are sometimes called stones, and the fruits that have them are called stone fruits. Peaches and plums are stone fruits. So are cherries.



THREE FRUITS YOU KNOW, AND HOW THEY LOOK WHEN CUT IN HALF.

Oranges are not stone fruits, and they are not core fruits. Orange seeds are near the middle of the orange, but they are not shut up in little seed boxes.

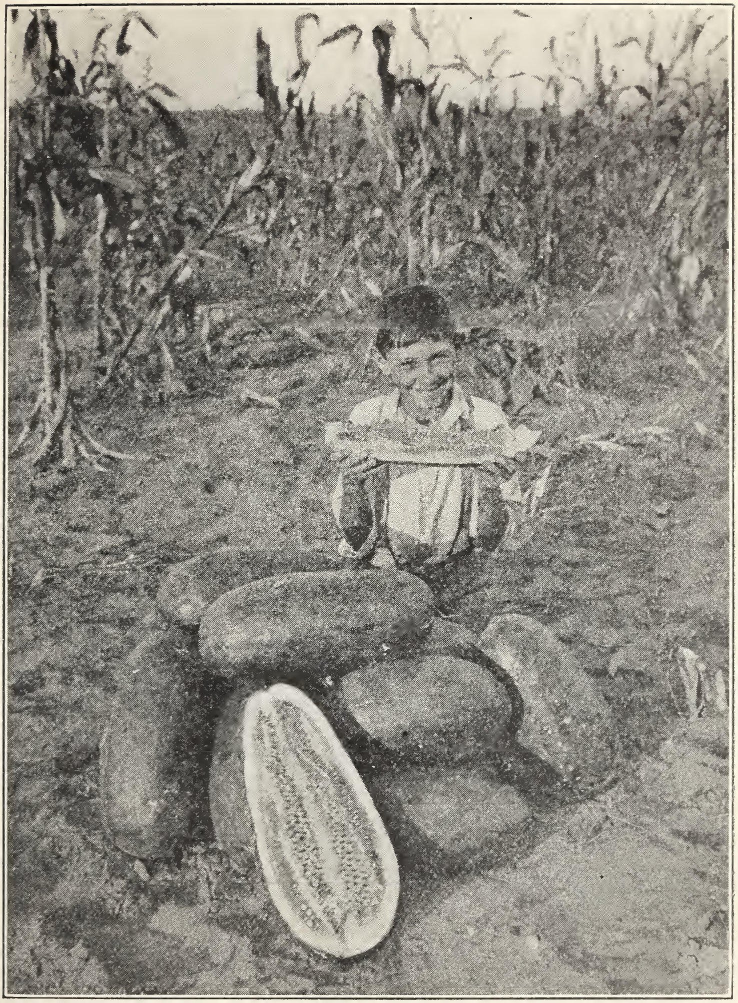
You know that oranges are not like

Courtesy of Tampa Board of Trade.

ORANGES GROW ON SMALL TREES.

apples or peaches. Oranges have more juice in them than apples and peaches have, but if you are careful, you can peel an orange and break it into pieces without spilling any of the juice. If you will try to break up an orange, you will see why this is.

Apples and peaches and plums and oranges all grow on trees. There are other fruits that do not grow on trees. Can you name any of them?



Photograph from J. Horace MacFarland Co.

THE BIG GREEN WATERMELONS GROW ON VINES ON THE GROUND.

The big green watermelons that we see on the fruit stand grow on vines on the ground. They are fruits of the kind we call melons. They lie on the ground in the hot sunshine until they are ripe and sweet.

The watermelon is the largest fruit on our fruit stands. The flesh is pink. Sometimes it is almost red. The watermelon seeds are almost always black, and there are very many of them. Would you like watermelons without seeds?

Some of the fruits you have been reading about can be found on the fruit stand all year. Others will be there only part of the year.

Most fruits are ripe in the summer or in the fall. Then there are many kinds of fruits on the fruit stands. The fruits you find on the fruit stand in winter are the ones that can be kept a long time after they are ripe.

SOME THINGS TO THINK ABOUT

From this list of words find the right word for each row of dots. You will have two words left over.

core vines trees stone bushes smooth fuzzy

1. The peach seed is sometimes called a . . . . .
2. The plum has a . . . . . skin.
3. Watermelons grow on . . . . .
4. Apple seeds are in the . . . . . of the apple.
5. Oranges grow on . . . . .

SOME THINGS TO DO

Draw a fruit stand and color the fruit. Put on your fruit stand any kind of fruit you like.

Cut an apple and look at the seed boxes. Find out how many seeds there are in each seed box.

Look at the seeds of a peach and a plum.

Cut an orange and see how it is different from an apple.

CHAPTER 10

A FISHERMAN IN FUR

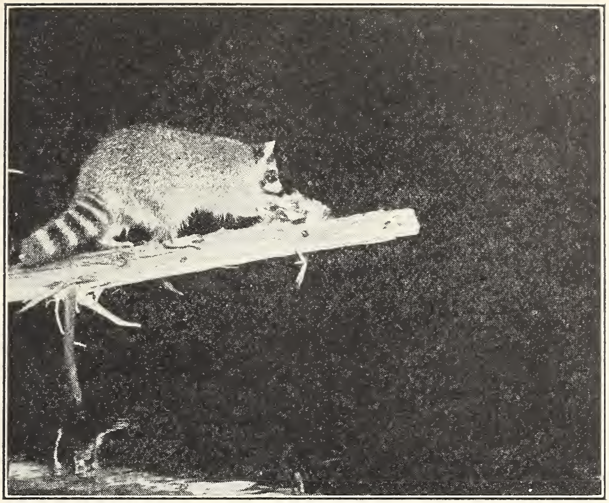
Why do you wear clothes?

What do our animal friends have in place of clothes?

Out in the woods lives a little animal that wears two coats. It has a coat of short gray or brown hair, and a coat of very long hairs. The long hairs are gray with black ends. The short hair of the undercoat is soft and fine. The long hair of the outside coat is coarse. The animal is the raccoon. It is often called the "coon," for short.

The raccoon is a funny-looking fellow. Even its face is funny. There are black rings around its eyes that look like goggles. It has sharp black eyes, pointed ears, and a long pointed nose. Its big, bushy tail is ringed with black and gray. The rings run around it.

Raccoons like to live near water. They like



From a Flashlight by George Shiras, 3rd.

THE RACCOON'S BIG BUSHY TAIL IS RINGED WITH BLACK AND GRAY.

to eat fish. They also eat frogs, and other animals that live in the water.

A raccoon sits on the bank of a stream and catches fish with its front feet, which are like hands. It has a funny way of washing what it is going to eat. It holds the meat in its hands and dips it up and down in the water over and over again. While it is washing its food, it seems to be looking around at other things.

After the food is washed, the raccoon holds it in its hands, and tears off pieces with its sharp teeth.

Raccoons sometimes rob hen roosts. They like to eat chickens. They rob birds' nests, too. They like tender corn. When they take corn from the garden, they often break the plants, and do much harm to the crop.

They eat turtle eggs and snakes. They like berries and wild grapes. In fact, a raccoon will eat almost any kind of food except green plants.

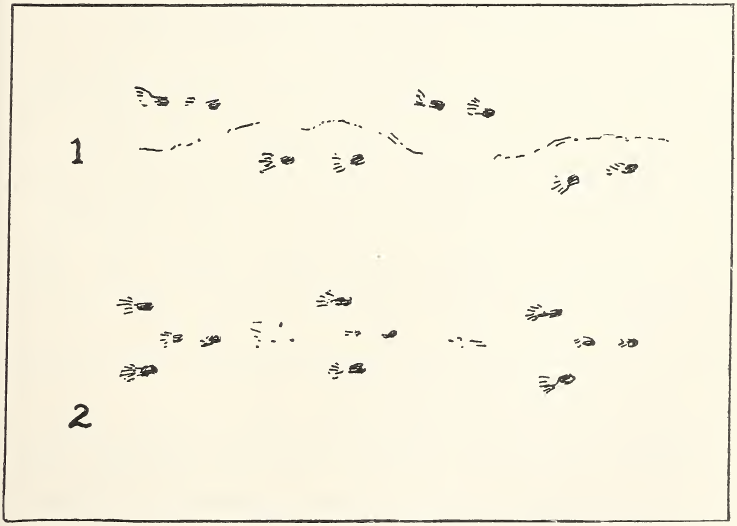
Raccoons sleep all winter. Just before they go to sleep for the winter they eat much food and store up fat enough to last them during the cold months. In the fall they curl up in their nests to sleep through the cold weather. Two or three sleep in the same nest.

They make their nests in hollow trees. Sometimes they make them in caves in the rocks near a stream.

If a warm spell comes during the winter, the raccoons wake up. They come out of their nests for a little while. You may find their tracks in the mud along the banks of streams.

Raccoon tracks are very queer. They look like the tracks made by a baby. The track of the front foot looks like a baby's hand. The track of the hind foot looks like a baby's foot.

Sometimes raccoons jump along instead of walking. They cannot jump as far as rabbits can. Their legs are short, and their bodies are heavy. But when the raccoon jumps, its tracks are placed like rabbit tracks. The prints of the hind feet are in pairs. The prints of the front feet are between and behind those of the hind feet. The track looks like this:



(1) RACCOON'S TRACKS, WALKING; (2) RACCOON'S TRACKS, JUMPING.

Photograph from New York Zoölogical Society.

LITTLE RACCOONS ARE BORN IN APRIL OR MAY.

Little raccoons are born in April or May. There are three, four, five, or six of them in each family. At first they cannot see. Both the father and mother help to care for them. The family stays together, and the old raccoons take care of the young ones for a year. Then the young raccoons are old enough to take care of themselves.

Have you ever seen a raccoon asleep in a tree? It sleeps most of the day and hunts food at night. When a raccoon goes to sleep in the fork of a tree it looks like a ball of fur. Its ringed tail is curled around it. The gray and black rings of the tail make it hard to see the raccoon.

Raccoons are pretty animals. Their two coats of fur make them look soft and round. Raccoons are intelligent animals, too. Some people like them for pets.

SOME THINGS TO THINK ABOUT

Find the parts of the story that tell about the things in the list below. Find the sentence with which each part begins. Find the sentence with which each part ends.

1. How the raccoon looks
2. What the raccoon eats
3. How the raccoon gets its food
4. How the raccoon spends the winter
5. How raccoon tracks look
6. The young raccoons
7. How the raccoon looks when it is asleep

SOME THINGS TO DO

Tell some of the things the raccoon has to help it to get a living.

Study the tracks of as many animals as you can find.

Draw the tracks of different animals.

CHAPTER 11

CHRISTMAS TREES AND CHRISTMAS GREENS

Where do you get your Christmas tree?

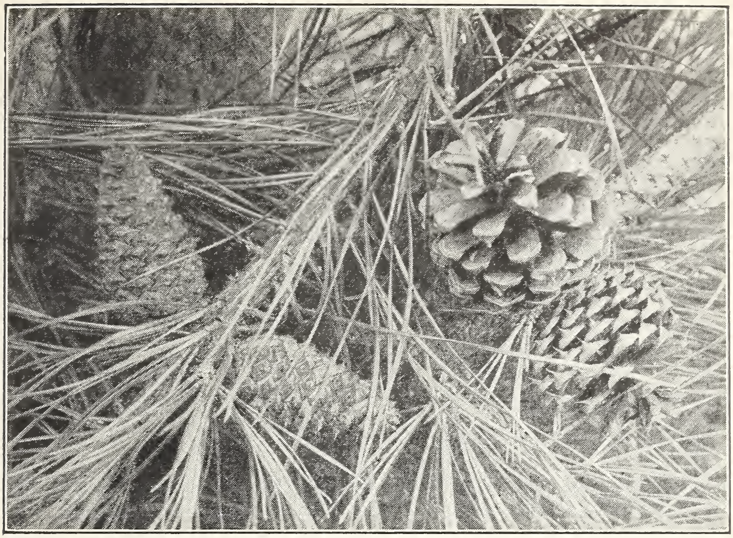
How do you think people should get Christmas trees?

What tree do boys and girls like best? There is only one answer to that. The Christmas tree, of course.

Trees that lose their leaves in winter would not make pretty Christmas trees. We use evergreens instead. The name evergreen tells how these trees are different from other trees. They are ever green—green all the time.

The pitch pine is an evergreen that makes a good Christmas tree.

Pine trees have needles for leaves. These needles are in little bundles. The pitch pine has three needles in a bundle. That is one way to tell it from other pine trees. The needles are three to five inches long.



Photograph by L. W. Brownell.

THE PITCH PINE HAS THREE NEEDLES IN A BUNDLE.

The pitch pine has dark red-brown bark. The wood is sometimes used for building. It is more often used to make fires.

The fruit of a pine tree is a cone. Cones of the pitch pine are sometimes three inches long. Inside the cones are seeds. When the cone opens the seeds fall out. They have wings to help them go away to new places, where there may be room for them to grow into new trees.

Pitch pines can grow in all sorts of places. Sometimes you find them high up on the rocks of a mountain side. Sometimes you find them on the sands of the seashore.

Every year thousands of pine trees and other evergreens are cut for Christmas trees. Some people raise them to sell. It is a good thing to do.

If more people would raise evergreen trees to sell for Christmas trees, there would always be enough. Unless people do raise them, the time may come when there will not be enough Christmas trees. Every year many of them are wasted.

Some people get their Christmas trees the wrong way. They go out in the woods and cut them down. They do not ask the people who own the land. They take the trees without asking.

Sometimes these people cut down two or three trees before they find one they want to keep. First they cut down one tree. Then they see another that they like better. They throw away the first tree and cut the other. When they do this three or four times, they waste three or four trees.

There are many people like that, and that

Photograph by L. W. Brownell. Courtesy of "Nature Magazine."

WE ALL LOVE THE BRIGHT RED HOLLY BERRIES.

is why there may not be enough Christmas trees in a few years.

If everybody buys his Christmas tree from a man who raises them to sell, there will always be enough.

Christmas trees are in danger, but they are not in as much danger as our Christmas greens. We all love the bright red holly berries, and the pretty green crowfoot.

Because people love them, they use too much for Christmas decorations. They go into the woods and break holly trees to pieces. They pull up crowfoot by the roots. That is a poor way to show love.

We must all use less of these plants, if we want any left. There are other things that can be used at Christmas time in place of them.

SOME THINGS TO THINK ABOUT

On a piece of paper tell in two or three sentences the wrong ways to get a Christmas tree. Tell in two or three sentences the right ways to get one.

SOME THINGS TO DO

Make a list of things that can be used as Christmas decorations in place of holly and crowfoot.

Plan a talk on "Why We Should Use Less Holly and Crowfoot."

Make your talk on "Why We Should Use Less Holly and Crowfoot" in other classes of your school. Ask the children not to pick any this Christmas. Ask them not to buy much.

Tell your parents about using less holly and crowfoot.

CHAPTER 12

A BIRD FRIEND OF THE WINTER

How can you tell other sparrows from English sparrows?

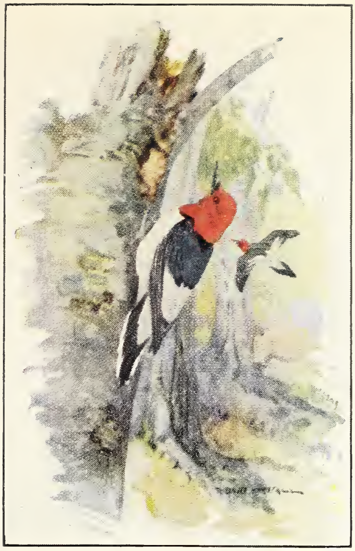
What do birds eat in winter?

Winter is a good time to learn to know birds. There are no leaves on the trees to hide them. This makes it easy for us to see and study birds in winter.

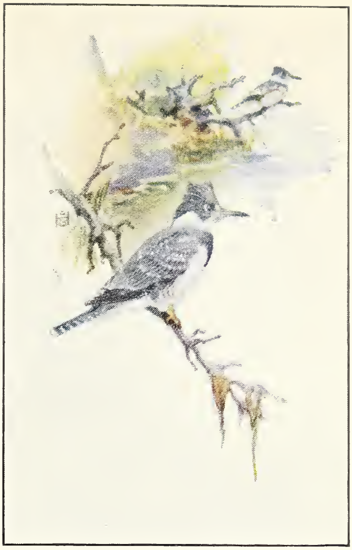
In winter most of our bird friends have gone away. It is easy to learn to know the few birds that stay with us and those that visit us in winter.

If you put out food for the birds on a cold winter day, you will soon learn how to know the ones that come to get it.

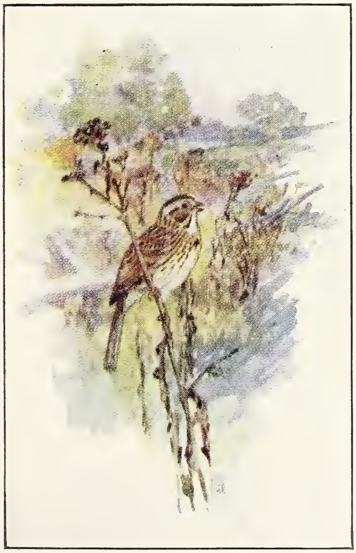
Everybody knows the English sparrow. It is sure to come if you put out food. Sparrows all look very much alike. Many people do not



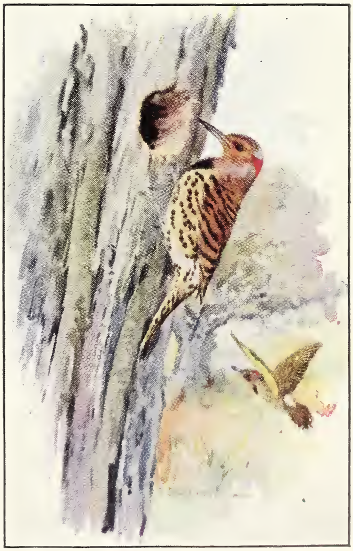
RED-HEADED WOODPECKER



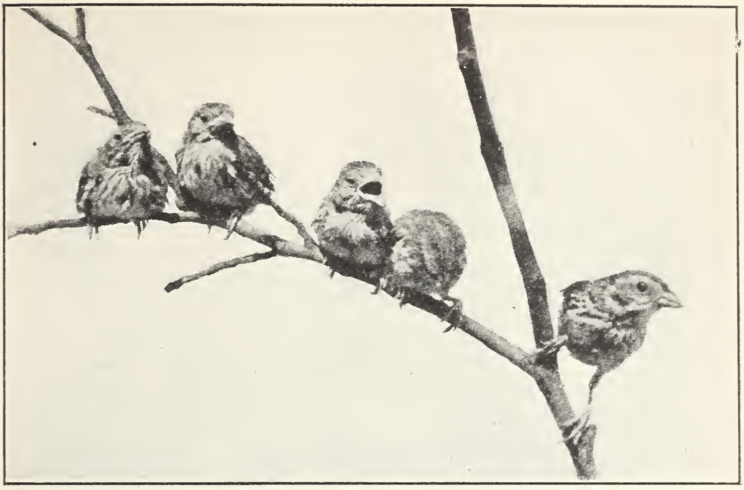
KINGFISHER



SONG SPARROW



FLICKER



Photograph by L. W. Brownell.

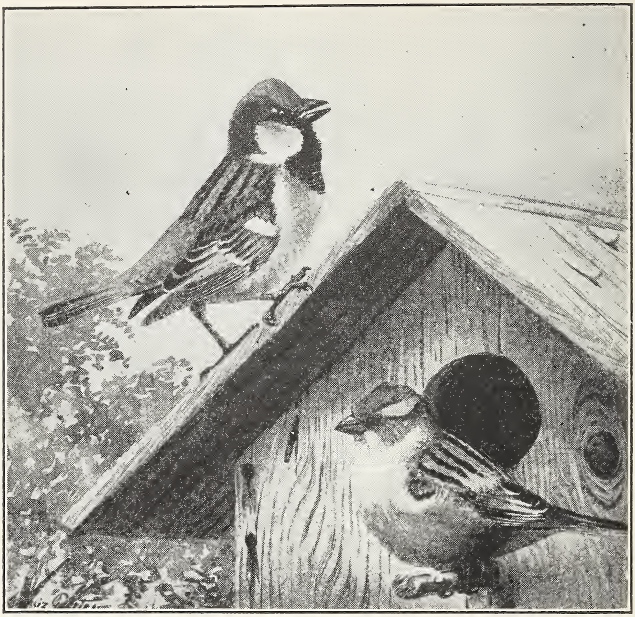
FOUR YOUNG SONG SPARROWS AND THEIR MOTHER.

know that all sparrows are not English sparrows.

Another sparrow may come to eat crumbs from your window sill. It looks like the English sparrow, but it does not act like it. It is the song sparrow.

The song sparrow is the same size as its cousin, the English sparrow. Its back is almost the same color, but you can know it by its breast.

The breast of the English sparrow is gray. The father bird has a big black spot like a



From a drawing by L. A. Fuertes.

THE ENGLISH SPARROW IS THE SAME SIZE AS THE SONG SPARROW, BUT HAS DIFFERENT MARKINGS.

bib. The mother English sparrow has no spot on her breast. The breast of the song sparrow is white with many brown spots on it. In the middle is a brown spot larger than the rest. The song sparrow's breast looks as if it had been splashed with mud.

English sparrows fight a great deal. They fight with each other, and they fight with other birds. They often drive other birds out of their nests.

Song sparrows are very different. They are happy birds. They love peace. They are good friends with other birds.

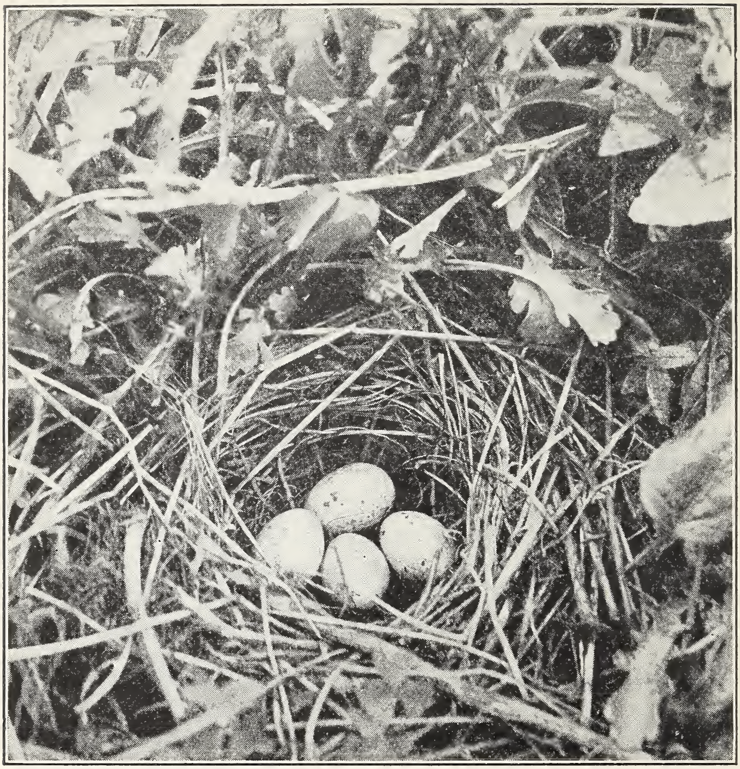
One sure way to know a song sparrow from an English sparrow is by its song. English sparrows do not sing. They make a short harsh sound. We say that they chirp. People get tired of their harsh chirping, because they do so much of it.

Can you guess what gives the song sparrow its name? The song sparrow sings one of the sweetest songs you will ever hear. Listen to it. You can hear it say, "Sweet, sweet, sweet, very merry cheer."

It likes to sit on a fence or on a bush when it sings. It holds back its head and pours out its song.

Most birds sing only in the spring. The song sparrow sings every month in the year. It sings in bad weather as well as when the sun shines. It even sings sometimes at night.

In the spring song sparrows make nests on the ground or in low branches. They



Photograph by Verne Morton.

SONG SPARROWS MAKE THEIR NEST ON THE GROUND OR IN LOW BRANCHES.

use grass and weeds to make their nests. Sometimes they line their nests with hair.

A pair of song sparrows raises three or four broods every summer. They build a new nest for each brood.

Song sparrows do not fly very high. If you come close to one on the ground, it flies up only two or three feet above the ground. Then it flies along in front of you, until it perches on a fence or bush.

Song sparrows are our good friends in more ways than one. They not only make us happy with their songs, but they eat insects and weed seeds that are bad for our gardens.

There are many song sparrows. They raise several families of young song sparrows each year. Their colors are like the ground, or like brown grass and bushes. It is hard for enemies to see them. They eat almost any kind of food. When they cannot get what they like best, they eat something else. They are always happy and cheery. Is it any wonder they get along no matter where they are?

Sparrows are not the only birds that will come to your yard for food. The junco, the white-breasted nuthatch, and the chickadee are almost sure to come. You will see them if you have sharp eyes. Look for them.

If you want to keep these good friends near, put out food for them when snow is on the ground.

One of the best ways to give it to them is to plant berries that they like to eat. Dogwood and holly have berries that the birds like. They are plants that make your yard beautiful. Plant them to help your bird friends.

SOME THINGS TO THINK ABOUT

Here are some sentences each of which has two endings. Pick out the ending that belongs with each sentence.

1. Winter is a good time to learn to know birds because
   - there are more birds here in winter than summer.
   - there are no leaves on the trees to hide them in winter.
2. Song sparrows
   - look like English sparrows.
   - act like English sparrows.
3. The sparrow that fights with others birds is
   - the English sparrow.
   - the song sparrow.
4. Song sparrows sing
   - a harsh song.
   - a sweet song.
5. Song sparrows sing
   - every month in the year.
   - in spring.

6. Song sparrows make nests
   high up in trees.
   near the ground.
7. A father and mother song sparrow raise
   three or four broods each summer.
   one brood each summer.
8. If you want to help winter birds
   plant berries.
   plant flowers.

SOME THINGS TO DO

Put out food for the birds every day. Find out the names of the birds that come to get it.

Find pictures of the junco, the white-breasted nuthatch, and the chickadee. Find out all you can about them by watching them and reading about them.

CHAPTER 13

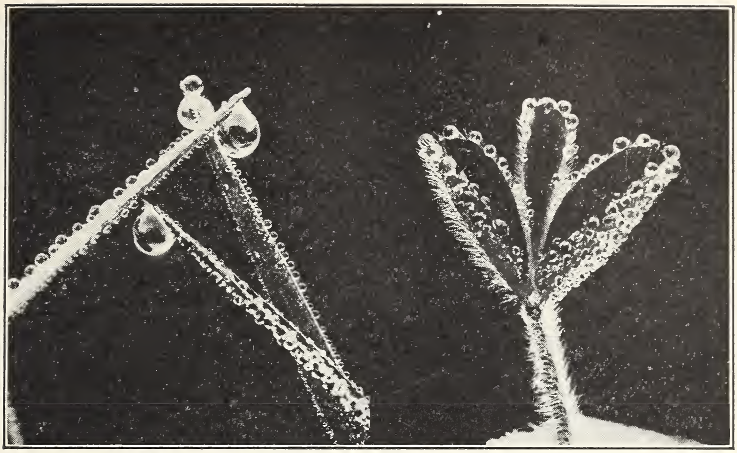
STRANGE WATER FORMS

What is in a cloud?
How are clouds made?

There is always water in the air, but we cannot always see it. It must be changed to tiny drops before we can see it. Sometimes, when the air is cooled, the water in it is changed to tiny drops. When there are thousands of these tiny drops together we call them a cloud. Sometimes clouds are near the earth but more often they are far above us.

When too many of the tiny drops come together, the cloud cannot hold them. Then they run together in large drops and fall to the earth. We say it is raining.

Do you like a rainy day? Some people do, but many people are not happy on a rainy day.



Photograph by W. A. Bentley.

DEW IS TINY DROPS OF WATER.

Children like to put on their raincoats and walk around in the rain. Some people like to ride in their automobiles while it is raining.

Many people like to sit in the house and read on a rainy day. It is pleasant to go to bed and hear the rain on the roof outside your window.

The plants must have rain. They cannot grow without it. Plants soon die if they do not have enough water.

The farmer likes to have enough rain for his plants. He knows that the plants in his fields will die without rain.

Animals need the rain, too. They need the water to drink. They could not live long without water.

Last summer perhaps you saw the dew on the grass. It looked like the dew on the leaf in the picture.

Dew is tiny drops of water. We see it early in the morning on the plants and other things near the earth. It comes at night.

When the sun goes down, the earth begins to cool. The grass and other things near the ground become cool first. Then as the warm air touches the cool grass the water in the air changes to tiny drops of water on the grass. The tiny drops of water are the dew we see the next morning.

If you bring a cup of ice cold water into a warm room, dew will gather on the cup. Where does it come from? The dew was water in the air that we could not see. Don't you think that is a good trick?

Sometimes when it is cold the water from the air freezes on the grass and other things. We call the frozen water frost.

A field all covered with frost is beautiful.

Photograph by Courtesy of "Nature Magazine."

THE FROST MAKES MAGIC PICTURES ON THE WINDOW GLASS.

How it shines when the sun comes up! But very soon the beautiful field is changed. The warm sunshine turns the frost to water again.

In winter perhaps you see frost on your window. It looks like the picture of frost in this book. The water from the air in your room has frozen on the cold window. The frost makes magic pictures on the window glass.

SOME THINGS TO THINK ABOUT

Find the parts of the story that tell about the things in the list below. Find the sentence with which each part begins. Find the sentence with which each part ends.

1. What a cloud is
2. Why it rains
3. What dew is
4. How dew forms
5. What frost is

SOME THINGS TO DO

Make pictures of the clouds you see in the sky.

Draw pictures of the dew on one piece of grass.

Draw pictures of the frost on your window.

Take a cup of ice cold water into a warm room. Look for the dew on the cup.

CHAPTER 14

A FARM ANIMAL

How large are cows?
What color are they?
Of what use to us are they?

There is no other place where boys and girls can have so much fun as on a farm. There is no other place where they can see so much magic as on a farm.

Every day in summer on the farm, green grass is turned into white milk. Every day in winter on the farm, yellow corn and brown hay are turned into white milk.

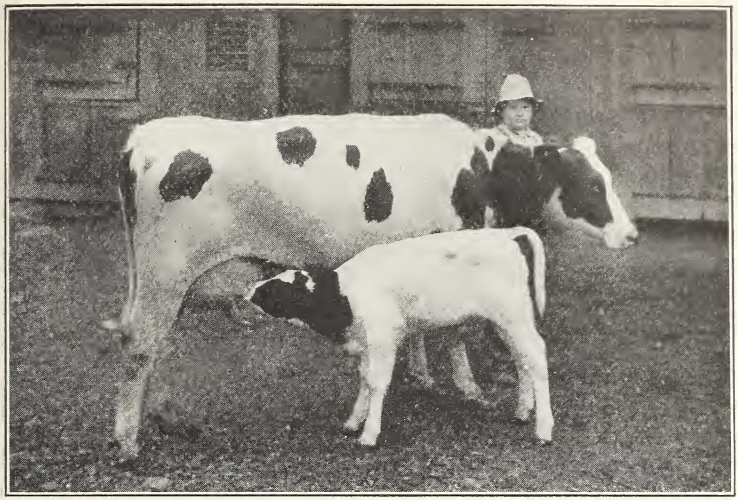
Who is the fairy that does it? She is the cow. You may laugh because the cow seems such a big and clumsy fairy, but her magic is real magic.

A field of green grass where cows eat is called a pasture. As long as there is green grass in the fields, you will see cows in the pasture.

Cows do not have front teeth in both jaws. A cow has eight front teeth in her lower jaw. She has no front teeth in her upper jaw. She cannot bite the grass. She tears it off. Watch a cow eating grass, and you will see her move her head up and down, as she tears the grass off.

She does not chew the grass at first. She swallows it whole. It would make us ill to swallow our food whole, but the cow's stomach is not like ours. She has a stomach that holds what she swallows until she is ready to chew it.

When the cow is ready to chew her food, she goes to a cool, shady place. She likes to stand in the shade of trees. Sometimes she lies down in the shade. She likes to stand knee-deep in water. Then her food comes up from her stomach into her mouth. Only a little comes up at a time. The cow chews it slowly and well. We call this chewing her cud. After she has chewed her cud, she swallows her food again. This time it goes into another stomach which is like ours.



Courtesy of the U. S. Department of Agriculture.

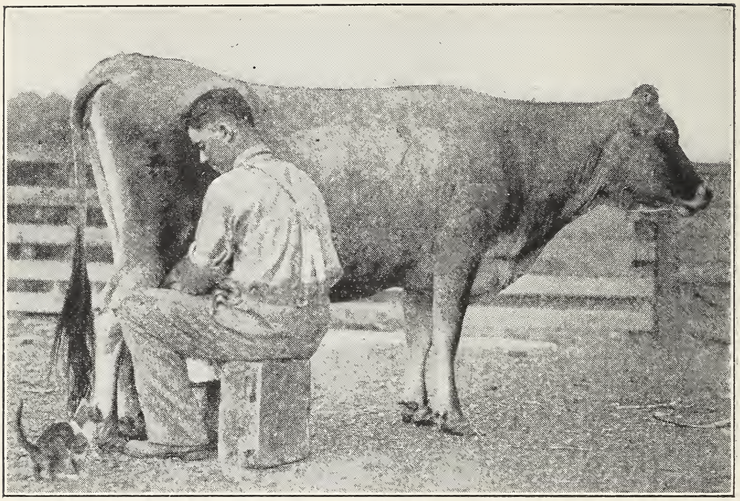
THE COW'S MILK IS THE FOOD FOR HER LITTLE CALF.

The cow belongs to a family called cattle. The cow is the mother. The father is called the bull. A young cow or bull is called a calf.

A calf is a pretty little animal. It has a soft smooth coat. It has very beautiful eyes. A little calf's legs always seem too long for its body. When the calf is born, its legs are not strong enough to walk far.

The mother cow hides her little one in the grass. There the calf stays without moving, while the cow goes to get food.

Between the cow's legs hangs a big bag.



Photograph by J. C. Allen.

COWS GIVE SO MUCH MILK THAT THE FARMER TAKES SOME FOR HIS OWN USE.

Another name for it is the udder. The udder holds the cow's milk. The cow's milk is the food for her little calf, but cows give so much milk that the farmer takes some for his own use.

Have you ever seen anyone milk a cow? Some farms raise nothing but cows. They are called dairy farms. Many cows are kept at these farms, and their milk is sold. We get the milk we buy in the city from dairy farms.

The mother cow says, "Moo, moo," when

she calls her calf. She has another call for the other cows.

When cattle are angry, they bellow. There is good reason to be afraid of an angry bull or cow. They can run fast, and many of them have sharp horns with which to fight.

Most cows are gentle. They do not want to fight. A cow is not often angry, unless you go near her calf. If you do, she is afraid you will hurt it. She will fight to drive you away. It is a good plan, when you are on the farm, to keep away from a calf when the mother cow is near by.

A cow's foot is called a hoof. It is divided in two parts. Find a cow's track and see what it looks like.

Besides giving us milk, cattle give us meat. Their meat is called beef. In some places they are used as work animals. They draw carts and plows.

When you go to the farm, be sure to see the cows. They are good friends of ours.

SOME THINGS TO THINK ABOUT

Here is a list of words. One of them does not belong with the others. Can you tell which it is?

cow
horse
dog
dress

Dress does not belong in the list because the other words are names of animals. Find the word in each of these lists that does not belong with the other words.

grass
candy
corn
hay

teeth
jaw
hoof
chew

barn
stomach
cud
mouth

udder
milk
calf
coat

SOME THINGS TO DO

Visit a farm to see cattle.

Listen to the sounds the cattle make. Try to make the same sounds.

Ask the farmer to show you how he feeds his cattle, where they sleep, and how he keeps the stable clean.

Make a sand-table pasture and stables to show what should be done to take care of cattle.

Draw a picture of the cow's tracks.

CHAPTER 15

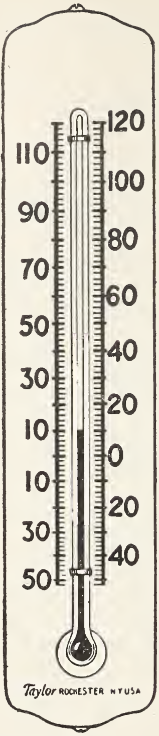
THE STORY OF THE THERMOMETER

Is it warm or cold today?
Can you tell how warm it is?

When people wish to know how warm it is, they look at the thermometer. Do you have a thermometer at home? Look for one at home and at school. Here is a picture of a thermometer. Thermometers are not all just like this picture, but this should help you know a thermometer when you see one.

There is a bright line in the thermometer that moves up and down to show how cold or how warm it is. Sometimes the line that moves is red. More often it is the color of silver.

In the glass part of the thermometer is something that makes the red or silver line that we see. If the line is red, it is alcohol;



THIS IS A PICTURE OF ONE KIND OF THERMOMETER.

if the line is the color of silver, it is mercury. When the mercury or the alcohol gets warm, it gets larger and needs more room. Then it moves up in the glass. When it gets cool, it gets smaller, and it does not need so much room. Then mercury or alcohol moves down in the glass.

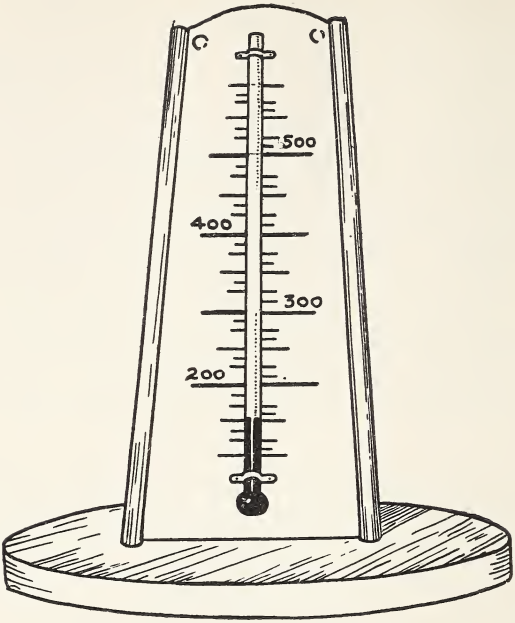
Do you know how cold it is when water changes to ice? You can tell if you use the thermometer. The mercury will go down to the number 32. Find 32 in the picture.

This thermometer is used to tell if the room is too warm. How high can the mercury go in it? Do you know how warm the house should be? Some people like it 70° or more, but it is better to keep the house at about 68°.

Do you see the little ring ° by the numbers? Do you see the tiny lines on the thermometer? When the mercury goes from one tiny line to the next one, it has moved two degrees. The little circle ° means degree.

The thermometer helps us to be comfortable. It tells us when our homes and schools are warm enough. Sometimes people keep their homes too warm. Then they are not comfortable. Many times these people are not well. So the thermometer helps to keep us well, too.

In the summer when it is very hot the bright line will go up nearly to 100°. But in the winter it stays very low. In some parts of



PEOPLE USE THERMOMETERS FOR COOKING.

the country it goes to 30° below zero. Then we say it is very cold.

Some people use thermometers when they cook and make candy. These thermometers have more degrees on them. Some of them have 212°. When water is very hot the bright line will go nearly to 212°. It goes all the way to 212° when the water boils.

SOME THINGS TO THINK ABOUT

1. What makes the bright line in the thermometer move?
2. What is in a thermometer?
3. What happens when mercury becomes warm?
4. How warm should we keep our homes?
5. How cold is it sometimes in winter?

SOME THINGS TO DO

Look at the thermometer in the morning. Tell how warm it is.

Look at the thermometer at your home. Write the degrees where you find the bright line.

Put a thermometer in ice cold water. How low does the bright line go?

Put the thermometer with 212° on it in very hot water. How high does the bright line go?

CHAPTER 16

ABOUT DOGS

What animals have you had for pets?

Which ones could show that they knew you?

How did they show it?

Most boys and girls like to have animals for pets. They like to play with them and watch them play. They like to take care of them.

If you have had different kinds of pets, you know that some pets become good friends of yours. They learn to know you. They look for the food you bring them. They like to play with you. A pony is a pet of this kind.

Some pets never learn to know you or to play with you. They do not care who feeds them. Goldfish are pets of this kind.

Dogs are pets that know their friends. They know who feeds them. Some dogs like to play with children. The collie is one of these.

Courtesy of the U. S. Department of Agriculture.

A COLLIE IS A GOOD FRIEND AND HELPER.

The Collie

One of the most beautiful dogs is the collie. It is a large dog with long straight hair. It has a long narrow head. Its nose is pointed. Collies are of different colors. Many are brown and white.

The first collies were used to take care of sheep. Many collies still do this. They drive the sheep out to the field in the morning. They watch them all day, and keep enemies away. At evening they bring them in from the field.

There is a farmer who keeps cattle and sheep in the same field. He has a collie named Lad. Every evening Lad drives the cattle and sheep in from the field.

Sometimes the farmer says, "Lad, bring in only the sheep." Then Lad drives in the sheep. He leaves the cattle in the field. He drives the sheep to the barnyard. The farmer says Lad is as much help as a man.

The farmer has two little boys. Lad is their good friend. He will not let anything hurt them. One day a strange dog growled at the boys. Lad fought the dog and drove it away.

A collie is a good friend and helper.

THE AIREDALE

Airedales are fine dogs, too. They are big dogs, but do not look at all like collies. Most airedales are red-brown with dark gray on their backs.

Airedales love their friends. One winter day two airedales were walking across the ice on a lake. There was a hole in the ice covered

Photograph by J. C. Allen.

AIREDALES LOVE THEIR FRIENDS.

with snow. One of the airedales fell in. He could not get out. The water was very cold. It seemed that he would drown.

The other airedale barked as loud as he could. Then he caught his friend by the neck with his strong teeth. The dog in the water was heavy, but he held on. He set his strong claws in the ice to keep from being pulled in. He held on hard with his strong legs. At last a man came and helped him pull the dog out of the water.[1]

Have you ever seen an airedale try to catch a rabbit? It follows the rabbit by smelling its track. Dogs do not use their eyes to catch other animals. They use their noses. They keep their noses close to the ground as they follow the track.

The Eskimo Dog

Have you read of the Eskimo dogs of the Far North? They do much work. They pull sleds for hundreds of miles over the ice and snow. Eskimo dogs are great fighters.

When a dog fights, it uses its teeth. It has four long teeth in the front of its mouth. There are two in the upper jaw and two in the lower. It tears its enemy with these long teeth. Besides these teeth for tearing, the dog has other teeth for biting and gnawing.

Your pet dog can tell you how he feels. He cannot talk, but he tells you in other ways.

---

[1] Story from *Nature Magazine,* Oct., 1925.

Photograph by Courtesy of "Nature Magazine."

ESKIMO DOGS DO MUCH WORK FOR THEIR MASTERS.

When he is happy, he wags his tail, he jumps and barks. When he is angry, he growls and shows his teeth. When he wants to make friends with a stranger, he smells him and wags his tail. If he is ashamed, he puts his tail between his legs and walks away. When he wants to show that he loves you, he licks your hand.

A family of puppies is great fun. Puppies are full of mischief, but they are like babies. They need good food, good care, and lots of sleep. If you have a puppy, be sure its gets all these things.

Until puppies are taken from the mother dog they should not be fed. After that they should be fed three times a day. One meal should be of bread and meat. The other meals should be milk and bread. Older dogs should have two meals a day.

SOME THINGS TO THINK ABOUT

Some of these sentences are true. Some are not true. On a piece of paper write the number of each sentence. If it is true, write *Yes* beside the number. If it is not true, write *No*.

1. A collie is a small dog.
2. Puppies need no other food than their mother's milk, while the mother dog is with them.
3. Dogs use their eyes to catch other animals.
4. Dogs have two long teeth in each jaw for fighting.
5. When a dog is angry, he wags his tail.
6. Dogs growl at their friends.
7. Puppies need much care.
8. Airedales and collies look very much alike.

SOME THINGS TO DO

Tell about the dogs you know.

Bring your pet dogs to school and have a dog show.

Learn the name of each kind of dog in your show.

Find pictures of different kinds of dogs. Make a chart or scrapbook. Learn to know their names.

CHAPTER 17

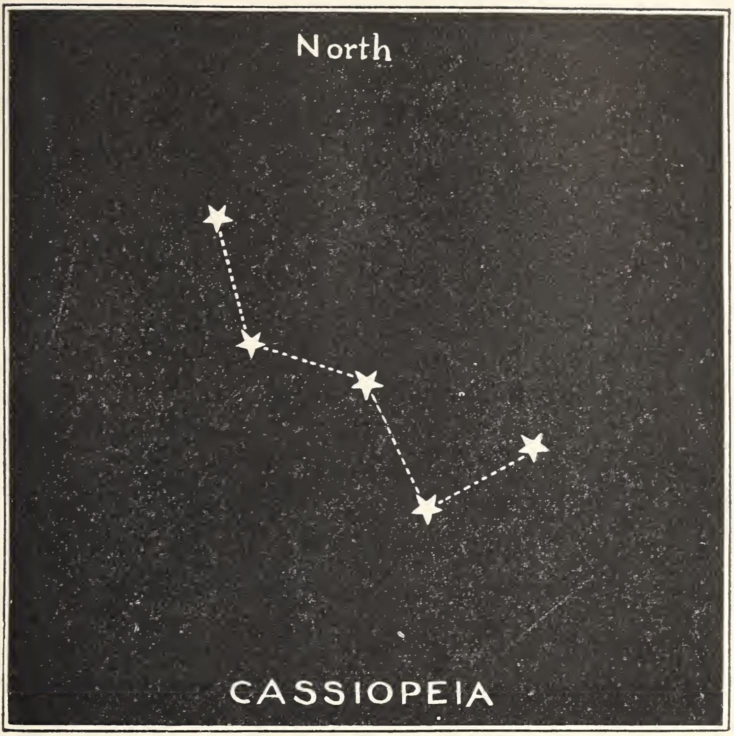
THE QUEEN'S CHAIR

Can you find the Big Dipper?
Can you find the Little Dipper?
Which way do you look to see them?

Do you remember reading about the Big Dipper and the Little Dipper? You found out that they are sometimes called the Big Bear and the Little Bear.

There are four stars in the bowl of the Big Dipper. The two farthest from the handle are called the pointers, because they point almost straight to the North Star. The North Star is not a large bright star, but it is one that you should know. Men guide their ships by the North Star. They sometimes find their way on land by watching it.

In January, about seven or eight o'clock in the evening, the Big Dipper is east of the



THERE ARE FIVE STARS IN THE QUEEN'S CHAIR.

North Star. West of the North Star is another group of stars that looks something like a chair. It is called Queen Cassiopeia's Chair.

There are five stars in the Queen's Chair. It really does not look much like a chair.

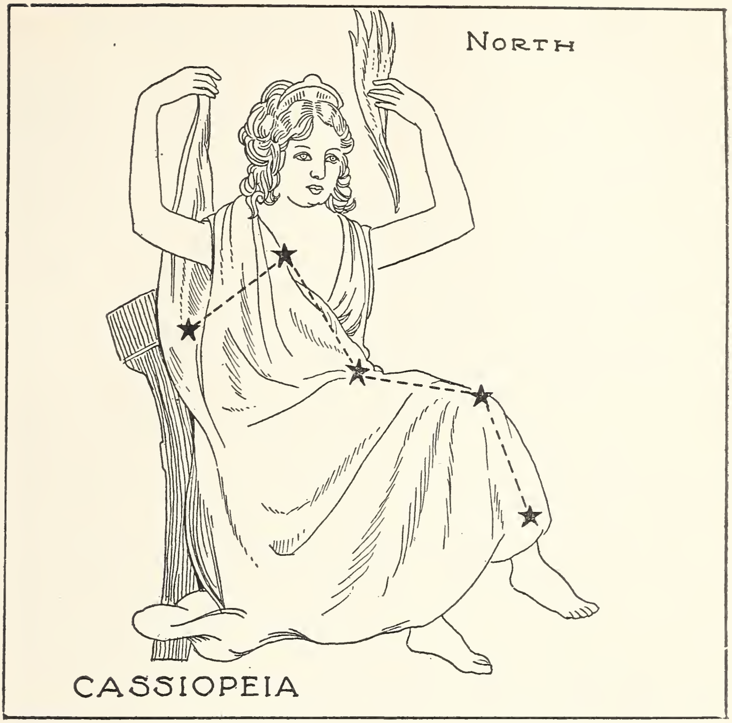
You remember reading in your second grade reader that long ago people were out of doors at night more than we are. They had more time to look at the stars than we have. They made up stories about the stars. This is the story they made about these five stars.

Queen Cassiopeia was very beautiful. She had a very beautiful daughter. The Queen was very proud, because they were both so beautiful.

In the sea, near Queen Cassiopeia's home, there lived some water fairies. They were called sea nymphs. The sea nymphs were beautiful too, but Cassiopeia said, "My daughter and I are more beautiful than the sea nymphs."

This made the sea nymphs very angry. They told their father, who was King of the Sea. He, too, was very angry at Cassiopeia, so he sent a dragon to eat up Cassiopeia's daughter, the princess. The King of the Sea knew it would hurt her mother more to see the princess eaten, than to be eaten herself.

The poor princess was tied to a rock at the side of the sea. On came the dragon. It seemed that he would eat her, but, just in time, a young prince came flying through the air.



PEOPLE LONG AGO THOUGHT CASSIOPEIA LOOKED LIKE THIS.

He did not have an airplane. He had wings on his shoes.

He saw the princess, and told her not to be afraid. He killed the dragon, and untied the princess. Then they were married.

After that Cassiopeia, the prince, and the princess were changed to stars, and set in the sky.

SOME THINGS TO THINK ABOUT

Here is a sentence in which you can choose between two words. One word is right and one is wrong.

Once there was a $\begin{matrix}\text{queen}\\ \text{princess}\end{matrix}$ named Cassiopeia.

Queen is the right word.

Copy these sentences just as they are written. Then cross out the word that is wrong.

1. You must look to the $\begin{matrix}\text{south}\\ \text{north}\end{matrix}$ to find Queen Cassiopeia's Chair.

2. There are $\begin{matrix}\text{five}\\ \text{six}\end{matrix}$ stars in the Queen's Chair.

3. Cassiopeia's chair and the Big Dipper are on $\begin{matrix}\text{the same side}\\ \text{opposite sides}\end{matrix}$ of the North Star.

4. The poor princess was $\begin{matrix}\text{saved}\\ \text{eaten}\end{matrix}$.

5. Men guide their ships by $\begin{matrix}\text{Cassiopeia's Chair.}\\ \text{the North Star.}\end{matrix}$

SOME THINGS TO DO

Look for the Big Dipper.
Find the pointers of the Big Dipper.
Find the North Star.
Find the Queen's Chair west of the North Star.

CHAPTER 18

THE HUNTER AND HIS DOGS

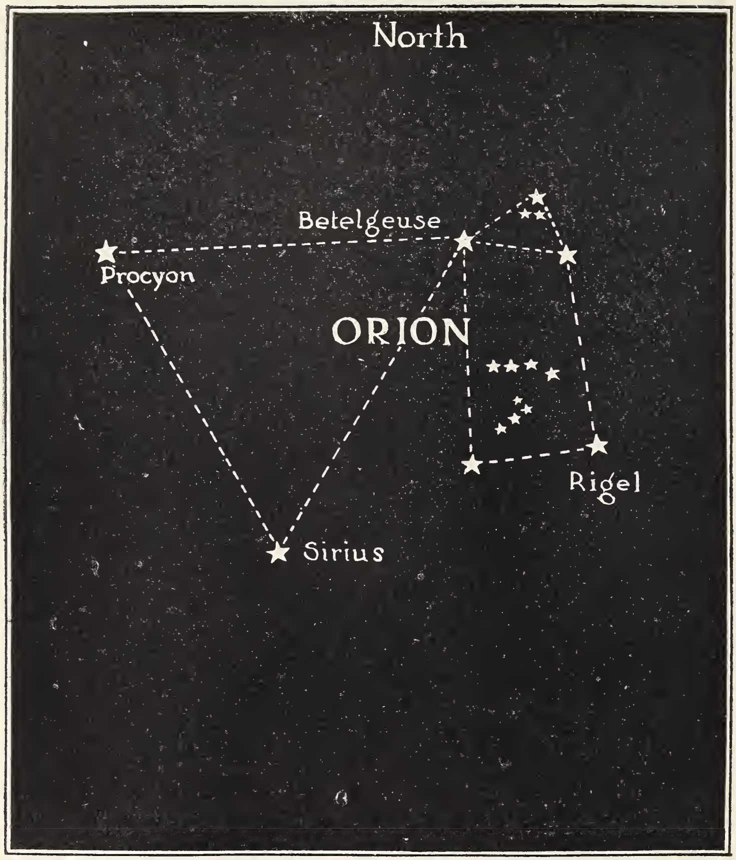
What stars do you know?
In what part of the sky are they?
How do you find them?

This book has told you how to find the Big Dipper and Queen Cassiopeia's Chair. Do you remember in which direction to look? They are in the north sky.

If you will look at the south sky, during the evenings of January and February you will learn to know the most beautiful star group of all. It is called Orion. The picture on the next page shows the way Orion looks in the sky.

And this is what people long ago thought they saw when they looked at these stars.

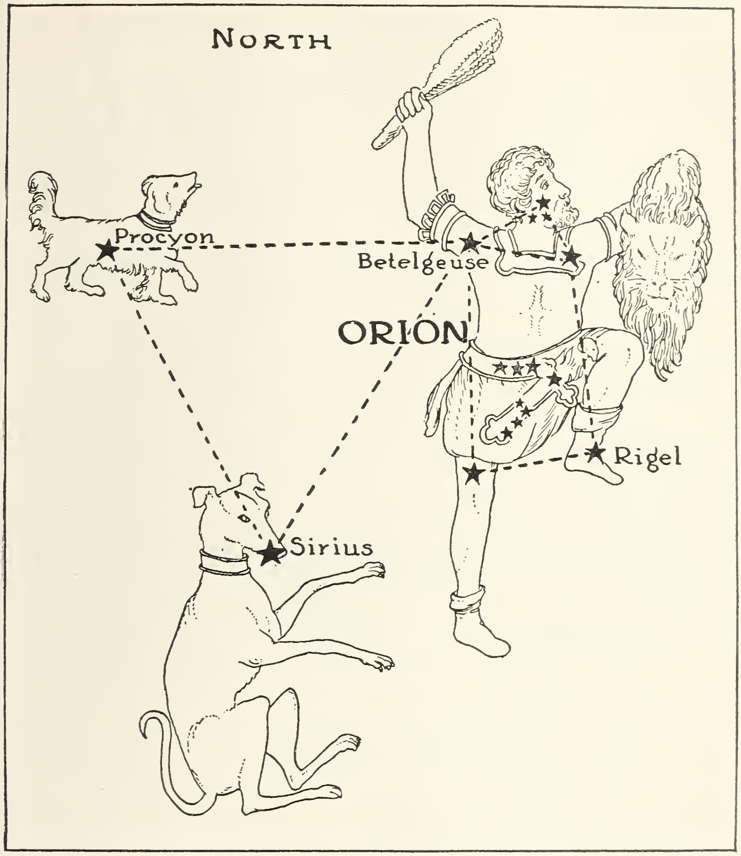
There is a very large red star on Orion's shoulder. It is many times as large and as bright as the sun, but it is so far away from



THIS IS HOW THE STAR GROUP ORION LOOKS.

us that it looks small. Its name is Betelgeuse (bĕt-ĕl-gûz).

Another large bright star is in Orion's heel. This star is not red, but white. It is called Rigel (rī′gĕl).



PEOPLE YEARS AGO THOUGHT ORION AND HIS DOGS LOOKED LIKE THIS PICTURE.

Around Orion's waist there is a belt of three bright stars. From the belt of bright stars there hangs a line of very small stars that make his sword.

Following Orion is the Great Dog. The mouth of the Great Dog is marked by the most beautiful star in the sky. It is Sirius (sĭr′ĭ-ŭs). Sirius is blue-white, and sparkles like a great diamond. It is not the largest star in the sky, but because it is near us it looks the largest.

Above Sirius is another bright star, Procyon (prō′sĭ-ŏn), which marks the Little Dog.

The people of long ago made a story about these beautiful stars. They thought that Orion was a great hunter. In one hand he holds a club with which he is going to kill a bull. The bull is shown in another group of stars. Two hunting dogs follow Orion.

Learn to know these stars. They will seem like old friends to you wherever you go. The more you learn about them, the more wonderful they will seem to you.

SOME THINGS TO THINK ABOUT

From this list of words find the right word for each row of dots. You will have words left over. You may use one word twice.

white
hunter
Procyon
blue
red
Little
Dog
Sirius
Cassiopeia

1. Betelgeuse, the star on Orion's shoulder, is . . . . .
2. The star in Orion's heel, called Rigel, is . . . . .
3. The name of the Great Dog is . . . . .
4. . . . . . looks larger than any star in the sky.
5. Orion was a great . . . . .
6. The Great Dog and . . . . . follow Orion.

SOME THINGS TO DO

Look for Orion and the Dog Stars.

Ask your teacher to tell you the stories about Orion.

Draw a star picture of Orion.

CHAPTER 19

CLUCK CLUCK AND QUACK QUACK

What do you think this chapter is about?

How can you tell a hen from a duck?

Do young ducks have to be taught how to swim?

Boats are made to go on water. Automobiles are made to go on land. Some birds are made to travel on water. Others are made to travel best on land.

You have seen chickens and ducks on a farm or in the market. Perhaps you have had a hen and a duck visit you in school. You know that they do not look much alike. The hen is a land bird, while the duck is most at home on the water.

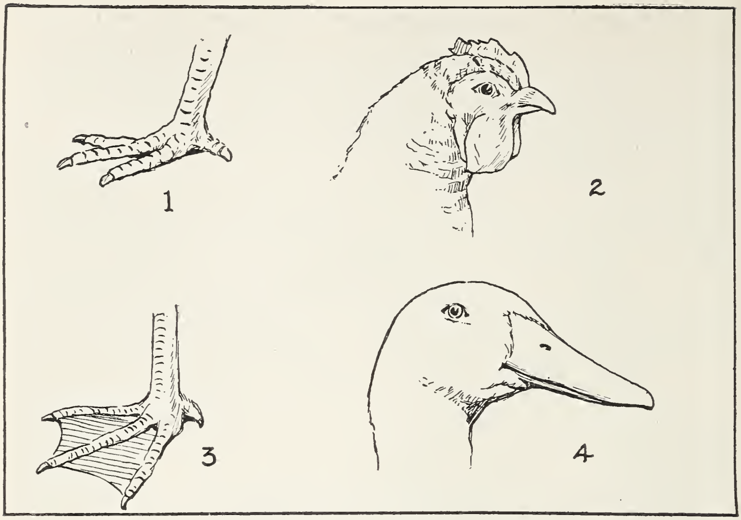
Both the hen and the duck have large heavy bodies, but they are not the same shape. The duck's body is broad and flat. It is shaped like a boat.

Photograph by J. C. Allen.

LITTLE DUCKS ARE AT HOME ON THE WATER.

We laugh at the way ducks walk. Their legs are short, and set far back on their bodies. Their heavy bodies swing from side to side on their short legs. We say that the duck waddles.

If a hen were to try to swim, she would be just as funny. Hens know they cannot swim, and they never try it. A hen's legs are long and strong. They are set under the middle



(1) HEN'S FOOT; (2) HEN'S HEAD; (3) DUCK'S FOOT; (4) DUCK'S HEAD.

of the body. It is easy for hens to walk and run.

The duck's feet are good paddles for swimming. There is a web of skin between the toes. We call them webbed feet.

The hen's long toes and sharp claws would not help in swimming, but they are good for scratching. Hens scratch seeds and insects out of the ground.

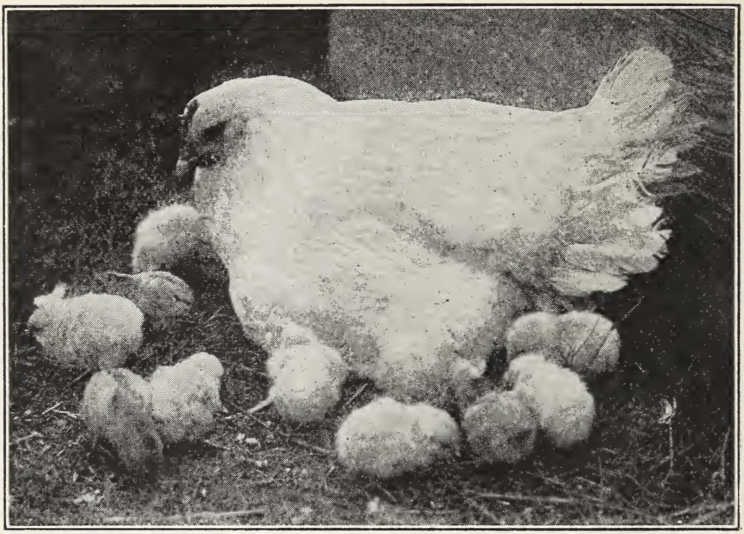
The duck sleeps on the ground. Hens can hold to branches, or to small poles in the hen house, with their long toes. A branch or pole on which a bird stands is called a perch. Chickens perch when they sleep.

Ducks spend much time in the water. They get most of their food there. They go under the water to get it. Watch to see them dive. They catch water insects and plants in their bills when they dive. The duck's broad flat bill is like a strainer along the edges. It holds food while the water runs out.

Hens have long sharp bills. They are good for breaking the ground when the hens look for food. They are good also for picking seeds and insects out of the earth. Neither hens nor ducks have any teeth. They swallow their food whole. It is ground up in their gizzards.

Both hens and ducks use their bills for cleaning and oiling their feathers. Near its tail, each of these birds has an oil sac. They press the oil out with their bills, and spread it over their feathers.

Have you ever heard of people spreading oil over their bodies before going for a hard swim? Chickens do not swim, but they are



Photograph by J. C. Allen.

A FAMILY OF YOUNG CHICKS IS A FINE SIGHT.

often in the rain. They need the oil then to keep the water from soaking their feathers.

A family of young chicks or ducklings is a pretty sight. They are covered with very tiny feathers, called down, when they hatch from the eggs. The most wonderful thing about them is that they can run about, follow their mothers, and help to find their own food the same day they come out of their shells.

"Cluck, cluck," says mother hen, and the little ones run after her across the yard or field.

"Quack, quack," calls mother duck to her family, as she leads the way to the water.

The father chicken is called a rooster. He is larger than the hen. He has more red on his head, and more beautiful feathers than she has. His tail is very large and beautiful. He is very proud. He flaps his wings and crows, "Cock-a-doodle-doo!"

The father duck is called a drake. Among the ducks that live on a farm it is often hard to tell a drake from the mother ducks. They look very much alike. Some drakes have more beautiful feathers than the mother ducks. When the ducks go to the pond the drake walks in front, and the ducks waddle along behind him in a row.

Sometimes duck eggs are put under a hen. When the little ducks hatch, the hen is quite pleased with her family. Soon the little ducks find some water and go for a swim. No mother needs to show them the way.

Then the poor mother hen is afraid. She thinks her little ones are in danger. She flaps her wings and calls them to come back, but the little ducks swim on.

When they have had their fun, they come back to her, and she takes them home. There they sleep all night under her wings.

SOME THINGS TO THINK ABOUT

Make two lists on your paper. At the top of one write *Hen*. At the top of the other write *Duck*. Put these words in the right list. Some may belong in both lists. Some may not belong in either list.

feathers
swim
scratching
gizzards
quack, quack
land bird
broad flat bill
perch
teeth
dive
oil sac
waddle
plow
eggs
rooster
webbed feet
cluck, cluck
drake
water bird
nuts

SOME THINGS TO DO

Take a trip to the zoo, park, or museum to see other land and water birds.

Talk over the ways in which land and water birds are fitted to their way of living.

Take care of a hen and a duck.

CHAPTER 20

THE SUN'S LIGHT

Of what use is the light from the sun?

Have you ever seen a rainbow?

Do you know how to make a rainbow in the schoolroom?

The sun is very far away, but it helps us very much. It gives us light every day. People could not live without the light from the sun.

Most plants cannot grow without the light from the sun. They would not make food for us without light. Have you ever seen a potato plant that has started to grow in the dark? It is white and yellow. It does not look like a potato plant. It cannot grow green without light.

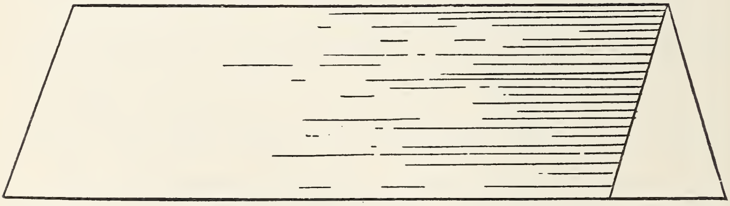
People would not like to live in a place where it was night all the time. They like the night to rest, but they are glad to see the bright light of the sun in the morning. The light helps people to do their work.

Do you know that light has colors in it?

Perhaps you have seen a rainbow in the sky after a rain. The rainbow has beautiful colors in it. The colors in the rainbow are the colors in the sunlight. When the light goes through the raindrops, it makes the rainbow.

When people water the lawn they can sometimes see a rainbow. The tiny drops of water are like rain. The light goes through them and makes the rainbow.

The colors of a rainbow are red, orange, yellow, green, blue, indigo, violet. Can you find all these colors?

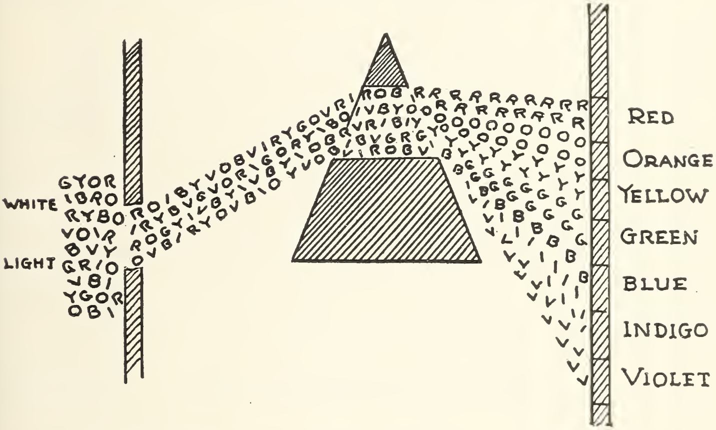


A PRISM.

Look at the piece of glass in the picture. Have you ever played with a piece of glass like this? It is a very nice toy. It is called a prism.

SOMETIMES TWO RAINBOWS MAY BE SEEN IN THE SKY.

If you hold a prism in the light in just the right way, it will make the colors of the rainbow. The prism should be held so that the rainbow is in a dark part of the room. You can see it better in the darker part of a room.



HOW THE PRISM FORMS THE COLORS OF THE RAINBOW

White light has all the rainbow colors in it. When the light passes through the prism, it breaks up into the separate colors.

It is wonderful to see a little piece of glass make all these colors. The prism can do more than the magician. It can make all these colors from white light.

Would you like to do some tricks with a prism like this?

SOME THINGS TO THINK ABOUT

Some of these sentences are true. Some are not true. On a piece of paper write the number of each sentence. If it is true, write *Yes* beside the number. If it is not true, write *No*.

1. Most plants can grow without the light from the sun.
2. The light helps people to do their work.
3. You can see a rainbow in the sky before a rain.
4. The raindrops make the rainbow.
5. There are eight colors in the rainbow.
6. You can make the colors of the rainbow with a prism.

SOME THINGS TO DO

Watch for a rainbow in the sky.

Watch for a rainbow on the lawn when people are watering it.

Make pictures of the rainbow.

Try to make a rainbow with a glass prism.

CHAPTER 21

THE MAGIC OF MAGNETS

How many tricks can you do with a magnet?

Do magnets pick up money?

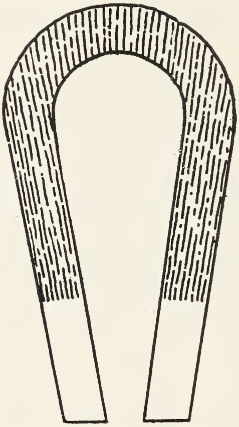
Do you know how to make a magnet?

Have you ever played with magnets? They are interesting toys. One kind of magnet is a straight piece of steel. It is called a bar magnet.

BAR MAGNET.

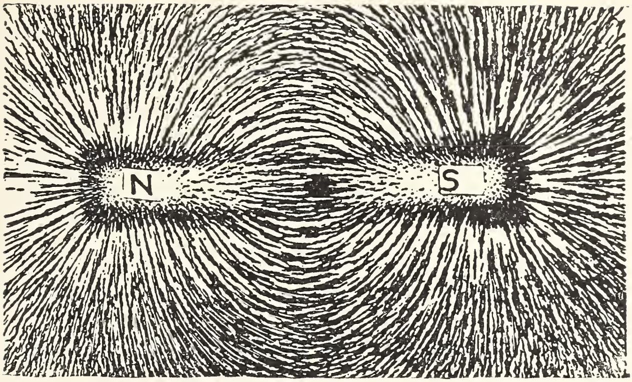
Another kind of magnet is shaped like a letter U or a horseshoe. It is called a horseshoe magnet. Perhaps you have played with one of these.

Magnets can pull certain things to them. It is wonderful to see how a magnet pulls on iron. The magnet will pull on small pieces of iron through glass if some glass is put between the magnet and the pieces of iron. The magnet makes the small bits of iron go into lines. The lines are always around the ends of the magnet.



HORSESHOE MAGNET.

Billy's class in school wanted to see the magic lines about the ends of a magnet. They put a magnet on the table and covered it with a piece of white paper. Then they put some of the tiny bits of iron on the paper. The tiny bits of iron made lines about the ends of the



THE BITS OF IRON FORM LINES AROUND THE ENDS OF THE MAGNET.

magnet. The lines were like those in the picture.

Pieces of iron and things made of iron are pulled to magnets. Paper, cloth and many other things are not pulled to magnets.

Would you like to make a magnet? Knitting needles or sewing needles can be used to make magnets. Put a needle on the table. Rub the end of a bar magnet on it. Rub from the point of the needle down to the eye. Do this about ten or fifteen times. Always rub the magnet along the needle the same way. Now hold the needle near some bits of iron. Is it a magnet? How do you know?

Billy's friend Ned has a magic theatre. Ned's father gave it to him for Christmas. Ned soon learned how to work it. Then he took it to school and gave shows for the children. One day he gave three shows in his room.

The theatre was made of cardboard. It was painted. It looked like a real stage.

Ned had three animals on the stage. The animals were a dog, a rabbit, and a pig.

It was fun to see how the dog chased the rabbit about the stage. When the rabbit was tired he would run off the stage awhile. Then the dog would chase the pig. Soon the rabbit would come on again. Then the dog would chase both the rabbit and the pig.

Ned had a good time. He stood back of the stage moving the animals where he wanted them to go, but the other children could not see how he did it.

Then Ned showed them how to make the players move on the stage. He had a small magnet in one hand. When he moved the magnet under the stage the players moved too.

Each player had a paper clip made of iron on his feet. This paper clip was pulled by the magnet. It moved the players.

The magic of this theatre was a real magnet. You remember what happened when the magnet was placed under the paper with the small pieces of iron on it. You now know why Ned could move things on the stage.

SOME THINGS TO THINK ABOUT

Here are some sentences each of which has two endings. Pick out the ending that belongs with each sentence.

1. Bar magnets
    are straight pieces of steel.
    are like the letter U.
2. The magnet
    pulls pieces of paper to it.
    pulls pieces of iron to it.
3. If you want to make a magnet, use
    a knitting needle.
    pieces of silver.
4. Magnets pick up
    money.
    nails.
5. The players in the magic theatre were moved by
    Ned's fingers.
    the magnet.

SOME THINGS TO DO

Bring some magnets to school. Try to find out which magnet is strongest.

Try to find out what things a magnet will pick up.

Make a list of things that a magnet will not pick up.

Make a magnet of a sewing needle and try to see if it picks up tiny bits of iron.

CHAPTER 22

THE CROW

Do you know a bird that flaps its wings all the time it is flying?

What have you ever seen a bird do that showed it was intelligent?

"Caw, caw."

Black feathers. Flapping wings. What are the big birds flying by?

They are crows.

The crow has a dull coat, but it is not a dull bird. It is very intelligent. It is full of fun, too. A pet crow is good company.

A true story is told about a pet crow that lived in a house with an outside cellar door. The cellar door sloped down to the ground. The crow had the lid of a tin baking powder can. He liked to see the bright lid slide down the sloping door. The crow would set the lid

Photograph by Verne Morton.

PET CROWS ARE GOOD COMPANY.

at the top of the door, and give it a push. He liked to watch it as it slid down.

One day he happened to step into the lid, and he went sliding down the cellar door in it. He liked his ride so much that after that he always slid down in the lid.*

Some pet crows learn to talk. They say only a few words. That seems like strange magic.

Wild crows show that they know as much as pet crows.

Crows like corn. Farmers think the crows eat too much corn. They forget that the crows eat many insects and field mice. The farmers put up scarecrows to scare the crows away. It does not take the crows long to find out that the scarecrow is only a stick with some old clothes hanging on it. They come and perch on the scarecrow.

When a flock of crows are getting food there is always one crow who watches for danger. If an enemy comes near he lets the others know.

Even the eyes and the bill of the crow are black. Its feet are black too. On the ground the crow almost always walks. Sometimes it hops. With its long bill it picks up food.

---

[1] Story from *National Geographic Magazine.*

Photograph by L. W. Brownell. Courtesy of "Nature Magazine."

CROWS MAKE THEIR NESTS HIGH UP IN TALL TREES.

Courtesy of U. S. Biological Survey.

THE FATHER AND MOTHER CROWS TAKE GOOD CARE OF THE YOUNG CROWS.

Crows make very large nests. They make their nests of sticks, bark, horse-hair, and grass. They put them high up in tall trees. The top of a pine tree is a place a crow likes for a nest.

The father and mother crow take good care of the young crows. They bring much food to the nest. The father and mother still feed the young crows after they learn to fly. They feed them for a while after they are grown to their full size.

After their families are raised, crows live together in flocks during the winter. The wood where they sleep is called the crows' roost. Often thousands of crows live at one roost.

Every morning the flocks fly many miles to find food. In the evening they go flap, flap, flapping back to the roost.

When you hear their harsh voices, "Caw, caw, caw," do not forget that crows do much good when they eat the insects and field mice that eat the farmer's crops.

Here is a poem about the crow written by a school boy in Washington, D. C. Can you write one?

Mister Crow

Dew in the morning,
Spring's in the land.
Old Mister Crow
Is here with his band.
Shiny and saucy,
The old fellow I saw
Down in the cornfield,
"Caw, caw, caw."

Sun hot and glowing
Summer is here;
Crow hunting breakfast,
Hop, grasshopper, dear.
Farmer is coming,
Calls you a pest.
Fly, Mister Crow,
Fly to your nest.

Snow on the mountain,
Winter is here,
Everything lonesome,
Everything drear,
But up in the treetop
My old friend I saw,
Saucy and cheery,
"Caw, caw, caw."

John Leckie
Morgan School

SOME THINGS TO THINK ABOUT

Find the parts of the story that tell about each of the things in the following list:

1. The crow's intelligence
2. The crow's food
3. How the crow looks
4. The crow's nest
5. How crows care for their young
6. Crow roosts
7. How crows fly

SOME THINGS TO DO

Learn the poem, "Mister Crow." Read the whole poem. Why are there three verses? What does each verse tell about? Make a picture in your mind of each verse as you read it. Read the poem from beginning to end three or four times. Close your book and see whether you can repeat it.

Watch crows to see what they do.

Write a story about a crow.

CHAPTER 23

MAKING ELECTRICITY

What kinds of toys do you like?
What tricks can you do with a comb?

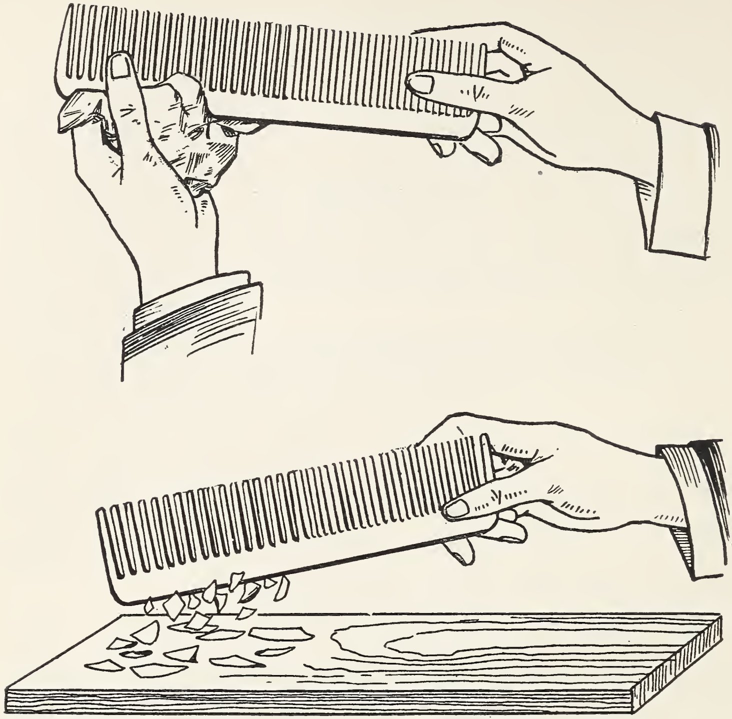
James is older than Billy and Ned. He knows how to do some good tricks. He can make a comb pick up pieces of paper. One day he showed Billy how to do it.

He used a comb made of hard rubber. He rubbed the comb with a piece of old coat. Then he held it near bits of paper. Do you know what happened? The comb picked up the bits of paper.

Billy tried to do the trick with the same comb and piece of coat. The first time, it did not work.

"Try it again," said James, smiling.

Billy rubbed the comb again, and it picked up the paper this time.

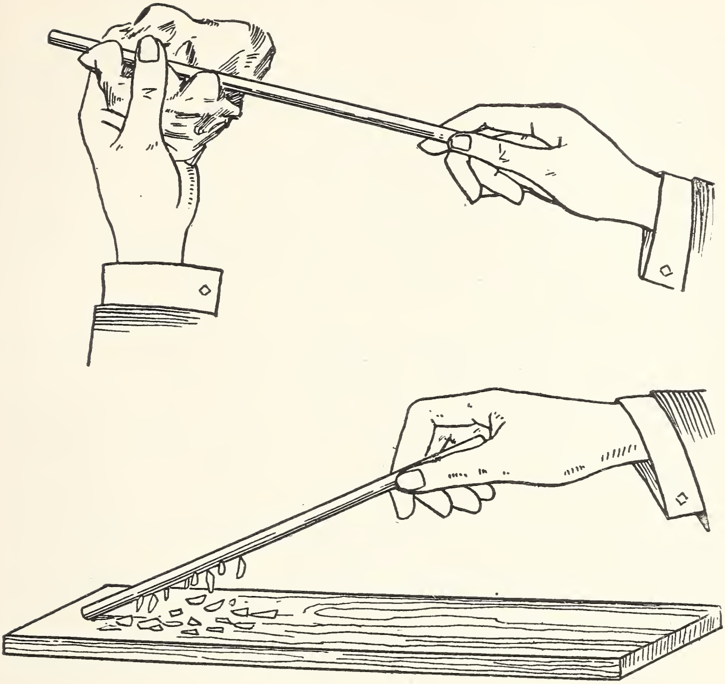


HE RUBBED THE COMB AND THEN HELD IT NEAR THE PIECES OF PAPER.

“That is a good trick,” said Billy. “Let us do some more.”

“I know another trick,” said James. “Father showed me how to do it.”

James had a long piece of glass. It was round like a pencil and about as big. He



THE GLASS THAT HAD BEEN RUBBED WITH THE SILK CLOTH PICKED UP THE PAPER, TOO.

rubbed the piece of glass with a silk cloth. Then he held it near bits of paper. What do you think happened? The glass picked up the bits of paper.

James and Billy did this trick many times. Sometimes it did not work the first time they rubbed the rod, but they always did it over until it did work.

These are electrical tricks. When the boys rubbed the comb they made electricity.

You have heard of electricity before. Many people have it in their homes. It comes to our homes from a big power house where it is made.

Electricity gives us light and heat. If we have electric refrigerators, it makes ice and keeps things cool for us. It rings bells for us.

Electricity helps us do our work. It helps to cook the meals and clean the house. It helps to wash the clothes. It was electricity that made the comb pull bits of paper to it.

If you visit the toy shop, you will see many toys. Some of them are electrical toys. It is wonderful to see how these electrical toys work.

There are electric trains in the toy shop. The trains have electric motors in them. Electricity makes the electric motors run. The electric motors make the trains run around the track. There are many other electric toys. Which ones have you seen?

SOME THINGS TO THINK ABOUT

This chapter told you how to do two tricks. Here is a list of the things you will need to work the first trick:

1. a comb made of hard rubber
2. a piece of an old coat or sweater
3. bits of paper

Make a list of three things you will need to work the second trick.

Make a list of six things electricity does for us.

SOME THINGS TO DO

Make an electric fish pond. Cut tiny fish out of paper. Use a shoe box for the fish pond. Put the fish in the pond. Use the comb for the fishing rod.

Rub the comb with a piece of old coat, and hold it in the fish pond. Then pull it out. If you did not catch a fish, try it again. You do not always get a fish the first time you try.

Try different kinds of combs. Rub them all with the same cloth. Pick out the one that works the best.

Try rubbing pieces of glass with silk cloth. The glass should not have sharp corners. Pick out the piece of glass that works the best.

Try other things you may find. Rub them with the same cloth. Tell what happens.

CHAPTER 24

WHISTLES

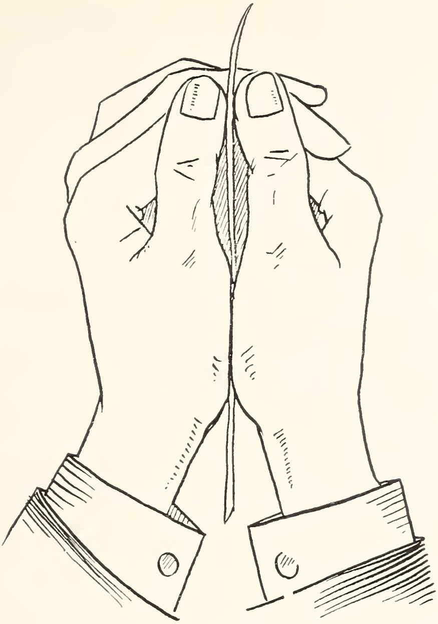
What kind of whistle do you like best?
Do you know how to make a whistle?

Some boys buy whistles, but you can have great fun making them. Would you like to know how to make a whistle?

Billy knew how to make a whistle with a piece of grass. He put a piece of grass between his thumbs. Then he blew hard against its edge. The other children could hear the loud sound. It was like magic.

The other children did not know how to do it. They blew over pieces of grass, too, but they did not make a sound. They tried to do it many times, but they could not make the whistle.

Then Billy showed them all how to do it. He showed them how to hold the piece of grass.



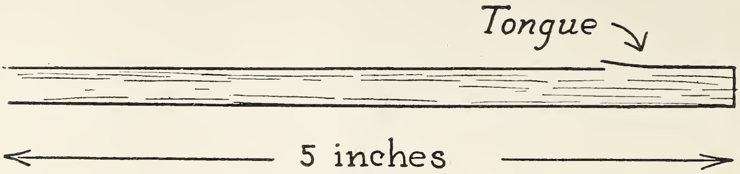
THE PIECE OF GRASS WAS HELD LIKE THIS.

In the picture you can see how he told them to hold it.

The children tried it again. This time most of them made a sound. The next time some more children could make a sound.

To make a whistle with grass, you must hold the piece just right. When you blow on the grass, it shakes quickly. This shakes the air. When the air shakes, you hear the sound.

Then Ned thought about another kind of



THE RYE STEM IS CUT THIS WAY TO MAKE A WHISTLE.

whistle. He had learned how to make it one day in the country. His father had shown him how to make it. He used the stem of a rye plant.

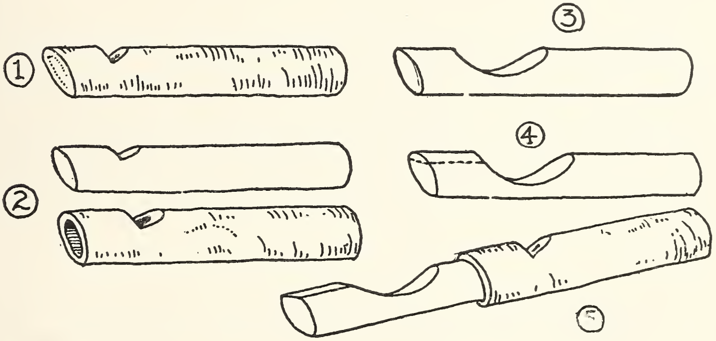
Ned asked his father to bring him some rye plants. He wanted to show the other children how to make rye whistles. The next day his father brought some rye plants from the country.

Ned gave each child a piece of rye plant. He showed them how to cut their pieces. The picture shows how.

They all tried to make the new kind of whistle. Some of the first whistles they made did not work, but soon they could all make this new kind of whistle.

When you put the end of the whistle in your mouth and blow, the tongue of the whistle moves back and forth very fast. This makes the air move back and forth very fast and makes the sound you hear. This kind of whistle does not last long, but it is easy to make a new one.

Spring is a good time to make whistles. In the spring you can make whistles from twigs of the willow tree. A willow twig for a whistle should be about as big as a pencil.



HOW TO MAKE A WOOD WHISTLE FROM A TWIG.

Cut the twig so that it looks like the picture (1). Only very sharp eyes will see just how to make it.

Then hammer the bark a little with your knife handle. Hammer over all the bark, but do not cut it. Soon the bark will be loose from the wood (2).

Pull the bark from the wood and cut the piece of wood as shown in (3). Then cut off a piece where the line of dots shows in (4). Then put the piece of wood back in the bark (5).

Your whistle is now ready to be blown. If it does not work, cut a little more on the line of dots. Do not cut too much away. Cut just a little. Then try it again. If this is not enough cut a little more.

When you blow air through this whistle it hits against the sharp edge of wood in front of your mouth. This makes the air move back and forth very fast and makes the sound you hear.

SOME THINGS TO THINK ABOUT

This chapter tells how to make three kinds of whistles.

1. Tell the names of the three plants from which these whistles were made.

2. All three whistles make a sound when you blow them because they have made something move. Tell its name.

SOME THINGS TO DO

Try to whistle with a blade of grass. If it does not work the first time, try again.

Try to make a whistle from a rye plant.

Try to make a willow whistle.

Find twigs from other trees. Try to make whistles from them.

CHAPTER 25

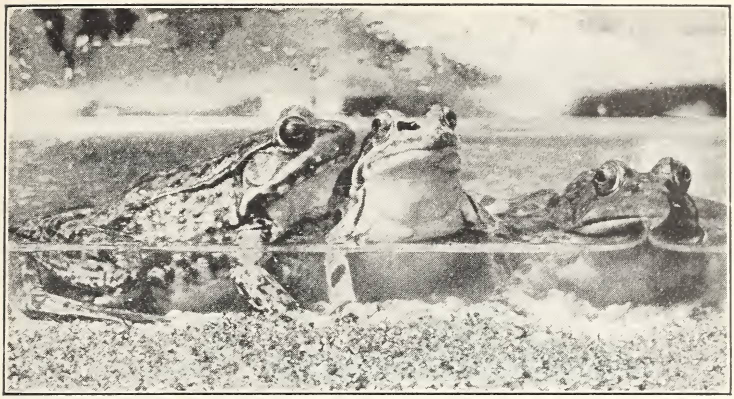
THE FROG

How can you tell a frog from a toad?
Why are frogs almost always green?
Why are toads brown?

If you have been near a pond or quiet stream this spring, you may have heard a song that was not the song of birds. It was the song of the frogs that live in or near the water.

Frogs look something like toads, but it is easy to tell one from the other. The frog lives among green things. The plants around its home are green. Most frogs are green. Their green color hides them from their enemies. Some frogs can change their color. Do you think this helps the frog?

Frogs are good jumpers. Like grasshoppers and rabbits they have big strong hind legs. When you go near a frog pond, the frogs on



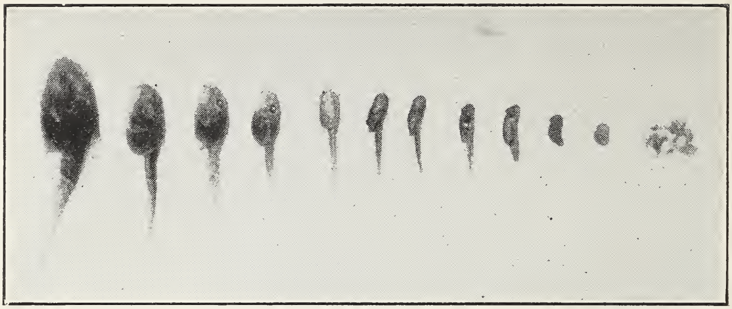
Photograph by L. W. Brownell.

THE FROG HAS A FUNNY FACE.

the bank jump high up in the air. Then, splash, they go in the water!

If you were to take a frog in your hand, it would feel cold and slippery. Things that are slippery are hard to hold. Being slippery helps the frog to get away from two of its enemies, the raccoon and the fox.

The frog has a funny face. Its eyes are big and round, and they stand out from the rest of its face. The frog can draw them in, if it wants to. Behind the eyes, and below them, are two flat spots. These are the frog's ears. The openings in the frog's nose are small. The frog can close them under water. The frog's



TINY TADPOLES HATCH FROM THE EGGS AND GROW.

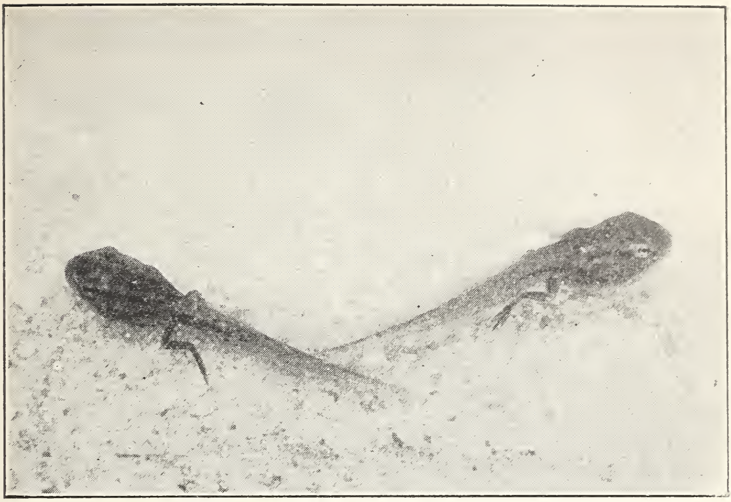
The frog's eggs are at the right of the picture. Then are shown tadpoles of different ages.

mouth is very wide. When out of the water, the frog's throat moves in and out all the time. That shows that the frog is breathing.

The funniest things of all are the sound sacs on each side of the frog's throat. They are just back of the eyes. When the frog sings, they stand out like little balloons.

In the winter the frogs dig their way deep into the mud near the ponds or streams. They go down too deep to freeze. They sleep there all winter.

In the spring they come out of the mud. Again they live in and around the water. They sing their spring songs. The mother frogs



Photograph by L. W. Brownell.

SOON THE TADPOLE'S LEGS APPEAR AND ITS TAIL BECOMES SHORTER.

lay their eggs at the bottom of the ponds, or in quiet places along the edges of the streams.

Frogs' eggs look like little black pills in light gray jelly. Toads' eggs look much the same, but the jelly around toads' eggs is in strings.

Tiny black tadpoles hatch out of frogs' eggs. At first they seem to be nothing but a head and a long tail. The tail is almost always wriggling.

In a month or two the hind legs can be seen.

About two weeks later the front legs can be seen.

Little by little the wriggling tail grows shorter. At last it is gone. Then the tadpole has turned into a little frog.

A mother frog may lay five thousand or six thousand eggs at one time. If all the eggs grew to be frogs, there would not be room enough for them in the water. Many of the tadpoles are eaten by fish and water insects.

Early in April is the best time to look for frogs' eggs. You can find them in the shallow water along the edges of a pond or a quiet stream. It is easy to dip up the eggs with a dipper and to put them in some pond water in a pail.

If you want to watch the frog's eggs, you should put them in a big glass jar full of water.

When little tadpoles hatch out of the eggs, they can be kept in a tadpole aquarium. Perhaps your teacher can tell you how to make a tadpole aquarium. Tadpoles must be fed every day.

SOME THINGS TO THINK ABOUT

Put the right answers with each question. Some questions have more than one answer. Some answers belong with two questions. Can you get them right?

wide mouth
in the mud
black pills
big frogs
being slippery
tadpoles
little frogs
green color
sound sacs
water plants
big eyes
long legs for jumping

1. What keeps frogs safe from their enemies?
2. What makes the frog's face funny?
3. With what does the frog sing?
4. Where do frogs spend the winter?
5. What do frogs' eggs look like?
6. What do frogs' eggs hatch into?
7. What may you see in a pond?

SOME THINGS TO DO

Draw pictures of frogs' eggs.

Draw pictures of tadpoles every time they change.

Draw pictures of frogs.

Write a story about a frog.

CHAPTER 26

SPRING JOURNEYS OF THE FLICKER

Why is spring a good time to see and study birds?

How do people know that the same birds come back year after year?

What kind of bird is a flicker?

Last summer the woods, fields, and parks were full of birds. In the fall there were not so many. In the winter there were very few birds to be seen. Now spring is here again, and with the spring more birds than we can count! It is just as if a magician had waved his wand.

The flicker is one of the birds that have come back to us again. We have not seen it since last fall. Where did it come from? Why did it come? Let us see if we can find out.

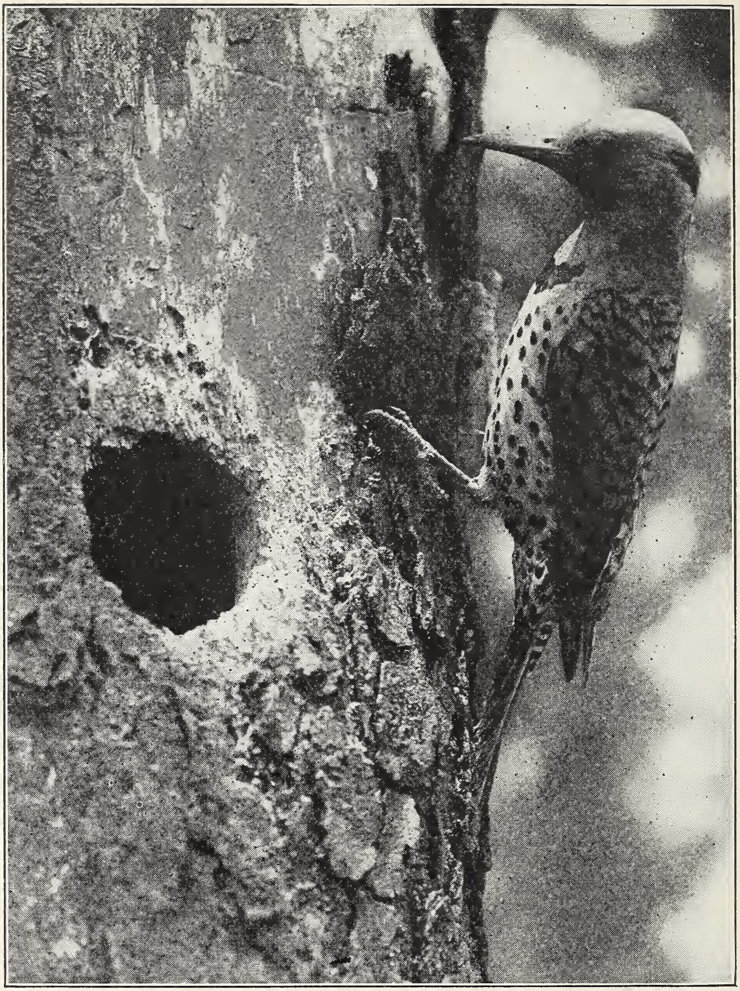
The flicker is a big bird, larger than a robin. On the back of its neck is a red band. Its back is brown-gray. Its breast is spotted with black, and there is one large black spot on the breast shaped like a new moon. When flickers fly, you may know them by a large white spot on the tail.

The flicker's wings are gray on the outside and bright yellow inside. It is often called the golden-winged woodpecker or the yellow-hammer. The father flicker has a black mark, which looks like a black moustache, on each side of his bill.

You will often see the flicker on the ground. It likes to eat ants. It stands over the ant hill, and puts its tongue into the door of the ants' home. The flicker's tongue is long and sticky. The ants run to the door to drive away the enemy. They stick fast to the sticky tongue. The flicker eats hundreds of ants for every meal.

When cold weather comes, flickers cannot find any ants to eat. They cannot find other food that they like. They fly south, where it is warm, to find food.

Flickers leave their homes to go south late in October. Some of them travel hundreds of



Photograph by L. W. Brownell.

A FLICKER MAKES ITS NEST IN A HOLE IN A TREE.

miles. In March or April they come back to make their nests and raise families.

A pair of flickers will make a hole in a dead tree with their strong bills. This hole is the nest where the eggs are hatched. It is fun to see young flickers climb over the tree in which their nest is.

Flickers will nest in a bird box, if it is deep, and has a door large enough for them to get in.

The journey that the flicker makes when it comes back, shows that it loves its home. A pair of flickers will use the same nest year after year.

Before they start home in the spring, the birds have had a long rest and much food. They are ready to fly a long way.

On these long journeys birds almost always fly very high up in the air. We do not know just how they find the way. We do know that they always go the same way, just as if there were a road through the air. This is real magic.

The white spot over the flicker's tail is like a tail light on an automobile. It helps the birds to see one another, and keep together.

The long journey that they make each spring and fall has many dangers. Storms kill some of them. Others fly against tall buildings or telegraph wires and are killed. But most of them come home safe.

The father flickers come back first. The mother flickers follow them. After the father flicker picks a place for the nest, he calls, "Flicker, flicker, flicker." He sings this song over and over, until the mother flicker comes, and it is time to keep house.

SOME THINGS TO THINK ABOUT

Pick out the true ending for each sentence.

1. The flicker is a
    - sparrow.
    - woodpecker.
    - kingfisher.
2. Most birds may be seen
    - in spring.
    - in autumn.
    - in winter.
3. Flickers eat a great many
    - flies.
    - caterpillars.
    - ants.

4. The flicker's tongue is
   short and stiff.
   long and sticky.
   round and soft.
5. Flickers come back to make their nests in
   January.
   July.
   March.
6. Flickers nest in
   an open nest on the ground.
   a hole in a bank.
   a hole in a dead tree.
7. Flickers make a long journey every spring
   to come back to their nesting place.
   because they like to travel.
   to make their wings strong.

SOME THINGS TO DO

Watch flickers.

Find out how they use the different parts of their bodies.

Watch each day to see what birds come home.

Put out some rags, string, or cotton. Watch to see whether the birds use them in nest building.

CHAPTER 27

SPRING WILD FLOWERS

What flowers can you find in the woods in spring?

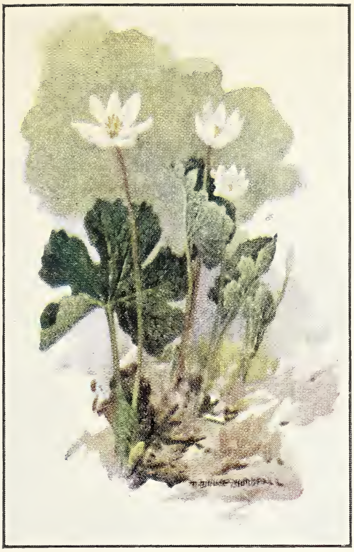
What wild flowers should not be picked?

Some of our most beautiful wild flowers open early in the spring. They are hard to find. Some of them are small. Some of them are almost all gone because people have picked so many of them.

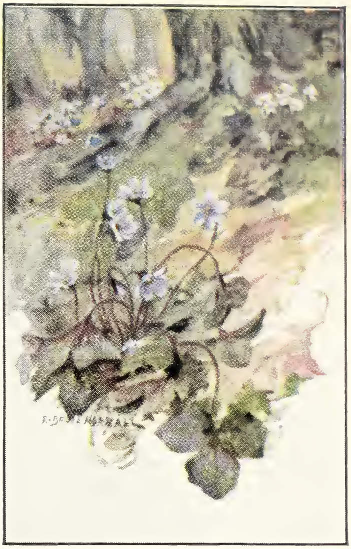
Bloodroot

Out in the woods grows a queer plant that has a queer name. It is called bloodroot.

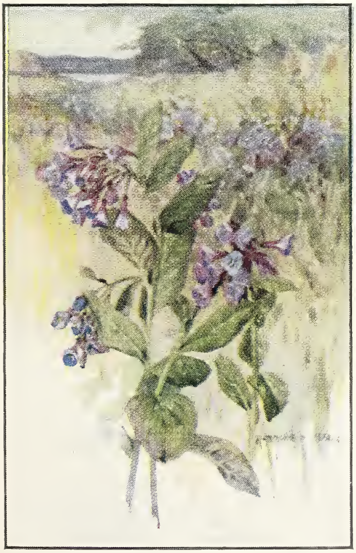
This plant has beautiful leaves. They look like the leaves in the picture. They are light green. Sharp eyes will see tiny pink lines in them.



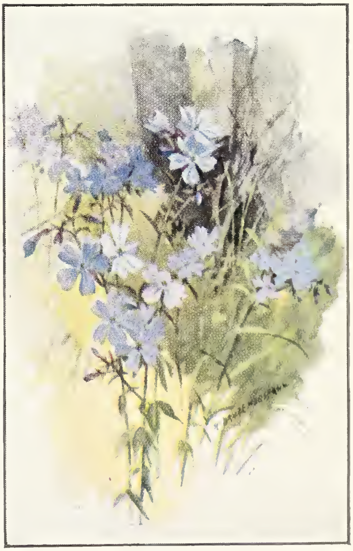
BLOODROOT



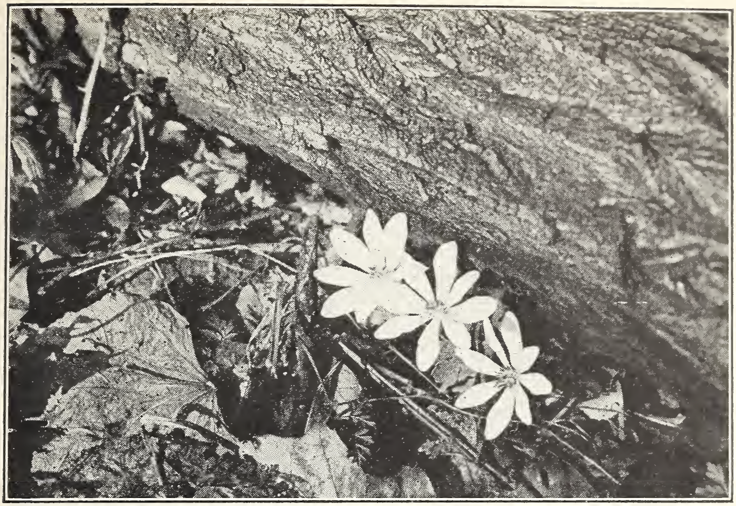
HEPATICA



BLUEBELL



WILD PHLOX



Photograph by C. R. Shoemaker.

THE INDIANS USED THE BLOODROOT PLANT TO PAINT THEIR FACES.

You can find bloodroot flowers in early spring, but you must go to the woods at the right time. The flowers do not last many days. If you go a day too late, you will not see them.

The flowers are white. I doubt if the children will know them. They look like the flowers in the picture.

The Indians used the bloodroot plant. They thought it helped to keep them well. They used this plant for paint, too. Did you ever hear of using a plant for paint? The bloodroot plant has red juice. The Indians used the juice to paint their faces. They used the roots as medicine for colds.

People should not pick many bloodroot flowers. There are not many of these plants. The plants need most of their flowers to make seeds. Have you ever seen the seeds of this plant?

If you pick the leaves the plant will die. The plant needs the green leaves to make food for it.

The bees like to visit bloodroot flowers. They gather the yellow dust in the flowers. This yellow dust is called pollen.

HEPATICA

One of our first flowers in the spring is the hepatica. The flower sometimes comes before the snow has gone. You will find this plant in the woods. It looks like the plant in the picture.

The flowers are blue, pink, and white. Have you ever seen the flower of the hepatica?

The bees like to go to this flower. They carry pollen to different flowers. Some flies carry pollen, too.

Photograph by E. L. Crandall.

THE HEPATICA SOMETIMES BLOOMS BEFORE THE SNOW IS GONE. THE FLOWERS ARE BLUE, PINK, AND WHITE.

You should not pick many of the flowers of the hepatica. If you pick many flowers the plant will not have enough seeds. You may pick some flowers when there are many, many of them, but they will soon wilt. Wild flowers do not stay fresh very long after they are picked.

BLUEBELL

Out in certain fields you will find a beautiful blue flower. It looks like a blue bell; so it is called bluebell. Because it likes water it grows best where the ground is damp. Sometimes you will find it along rivers.

Have you ever seen people gathering these flowers? They should not gather them, for there are very few bluebells left. Too many have been picked already. You can have fun hunting them, but let them grow. You can see them on the plant. There they can make seeds to grow into more bluebells.

WILD PHLOX

Have you ever seen wild phlox? It looks like the plant in the picture facing page 172. You may find the flower in the spring.

The flowers are pink and purple. Have you ever smelled these flowers? You may like to smell them.

Did you ever see people pick the phlox? So many people have picked it that now it is hard to find in most places. The way to show that you think it is pretty is to let it grow. Then its flowers will make seeds to grow into new phlox plants.

Here are three good rules to remember when you go to pick wild flowers:

1. Always leave the roots and leaves, so that the plant will go on growing.
2. Pick only a few flowers, even if you see a great many.
3. When you see only a few flowers do not pick any.

Unless you follow these rules many of our most beautiful wild flowers will soon be gone.

SOME THINGS TO DO

Watch for wild flowers when you are in the woods.

Tell in what kind of places you have seen the flowers.

Try to find the wild flowers you have just read about. Draw pictures of their leaves.

SOME THINGS TO THINK ABOUT

Here is another game. On one side of the page are several words that make a riddle. On the other side are some answer words, like this

something that flowers need   sunshine.

Take a piece of paper and put the right answer word beside each riddle. You will have three words left over.

1. the color of bloodroot flowers
2. the color of hepatica flowers
3. the place where bloodroot and hepatica grow
4. something that bluebells like
5. what wild flowers grow into

the woods
seeds
water
fields
purple
white, blue, pink
white
bees

CHAPTER 28

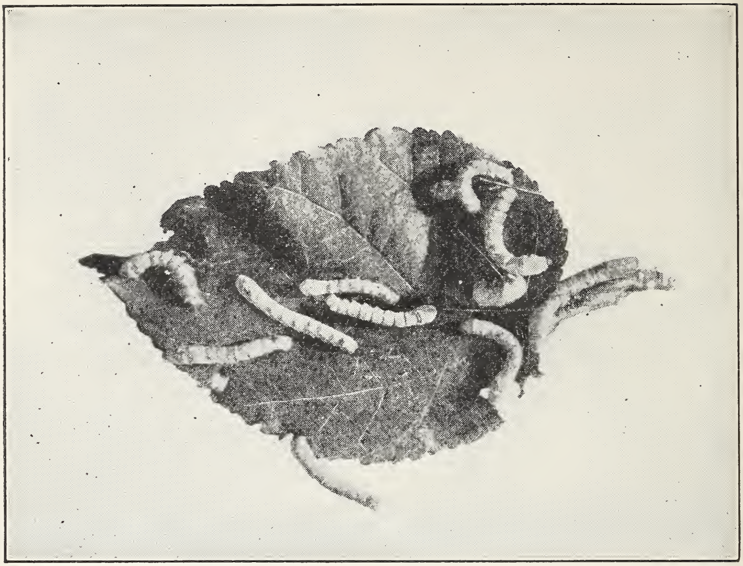
THE SILK MOTH

What do you wear that is made of silk?
Where does silk come from?

The best silk that is made into clothes for us is spun by the silkworm. The silkworm is a caterpillar that eats mulberry leaves. When it is ready to go to sleep it spins a silk cover around itself. It is this cover that is used to make your silk handkerchief, your silk necktie, or your silk dress.

It is interesting to raise silkworms in school. A third grade class tried it and did not find it hard to do.

In the spring when the mulberry leaves came out, they got some silkworm eggs. They kept the eggs on mulberry leaves in the schoolroom. The eggs hatched in about ten days.



Courtesy of the Corticelli Silk Co.

THE SILKWORM IS A CATERPILLAR THAT EATS MULBERRY LEAVES.

At first the young caterpillars were only half as long as a pencil is wide. They were very hungry. The teacher asked a boy named Fred to feed them. He chopped some mulberry leaves up very fine, and gave them all they would eat. The caterpillars ate more than eight meals a day!

A girl named Frances brought a tray on which to keep the young silkworms. After four or five days the tray needed to be cleaned.

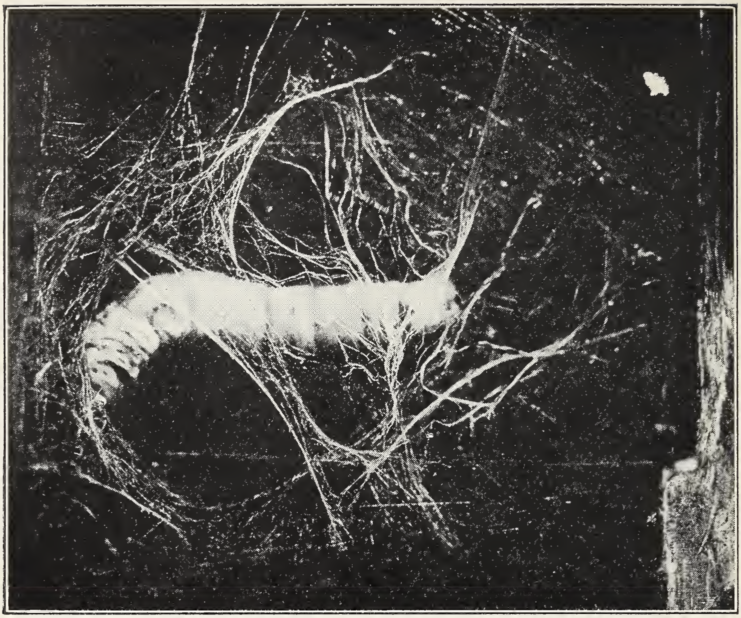
Frances laid mosquito netting with fresh chopped mulberry leaves on it over the old leaves in the tray. The little caterpillars were always looking for fresh food. They came through the netting to get the fresh mulberry leaves. After all of them had come through, Frances lifted the mosquito netting off, and cleaned the tray. She did this twice every day.

At the end of five or six days the caterpillars split their first skins, and came out in new ones. For a day before this happened the worms held their heads up and did not move.

The teacher said, "We must be very sure that the tray is clean when the caterpillars are going to shed their skins"; so Frances kept the tray very clean.

After the worms had shed their skins, the teacher told Fred not to feed them for several days. When they had rested, Fred gave them food again. He gave them eight meals a day. Frances changed the mosquito netting twice a day to clean the tray.

In four days the silkworms again split their skins, and came out in new ones. They were



Courtesy of the Corticelli Silk Co.

THE WORM SPINS A COCOON.

now old enough to eat whole mulberry leaves. Fred gave them six or seven meals of whole leaves every day. The caterpillars were now too large to come through the netting, but when they crawled on the fresh mulberry leaves, Frances placed them on a clean tray. She then cleaned the old tray, so it was ready for the next change.

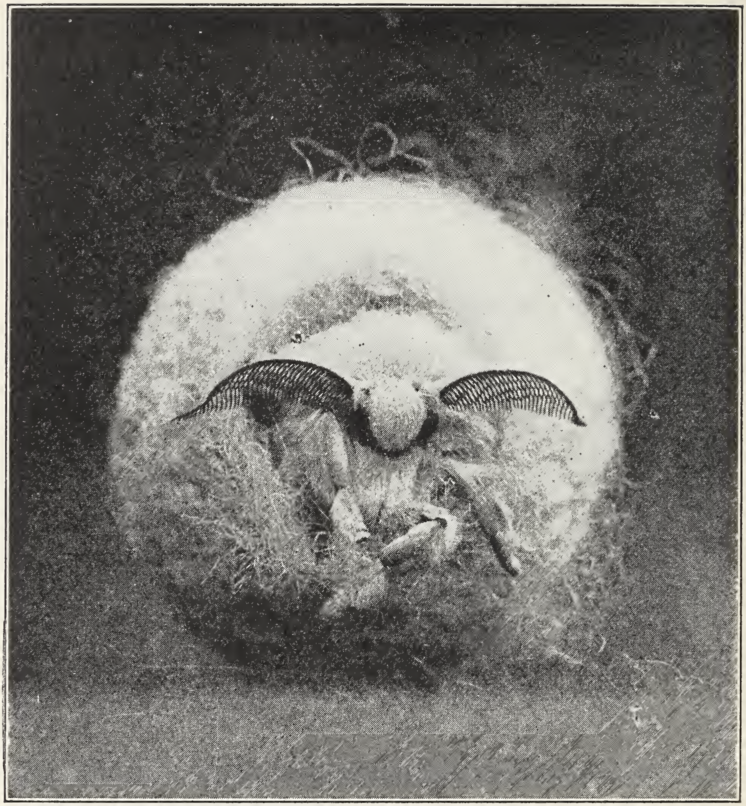
In six days more the silkworms changed their skins for the third time. They grew very fast. They needed more food. Fred gave them small branches of mulberry five or six times a day. When the silkworms crawled on the fresh branches, Frances placed them on a clean tray. Then she cleaned the old tray.

The worms changed their skins only once more. After this change Frances gave them fresh food all day long. They ate more in these eight or ten days than in all the rest of their lives.

The teacher said, "If you want your silkworms to live you must be sure to remember five things which I shall tell you about caring for them:

1. Let the worms alone while they are changing their skins.
2. Never let the sun shine on the silkworms.
3. Keep rats and mice away.
4. Never feed them old leaves, damp leaves, or wet leaves.
5. Keep the temperature always about 70° or a little over."

The silkworms ate hard for eight or ten days. Then they stopped. The children took small twigs without leaves, and made them into



Courtesy of the Corticelli Silk Co.

IN TWO OR THREE WEEKS A MOTH COMES OUT OF THE COCOON.

little bundles. They tied the thick ends together, and let the tips spread out so that there would be room for the worms to spin between the branches. They stood the bundles in the tops of jars. Then the children carefully lifted each worm and placed it on a twig.

The children had great fun watching the silkworms spin their silk covers. It took the worms three days to do it. Five days later the children gathered the cocoons. Cocoon is the name for the finished silk cover.

The children wanted to see moths come from the cocoons, so they strung them on a silk thread.

They had to be very careful, for they ran their needles through the sides of the cocoons without touching the sleeping insect inside. It was hard to do. They hung the cocoons up in a dark room where no mice could get them. In two or three weeks the moths came out.

Father moths are smaller than mother moths. The father moths move about, and move their wings. The mother moths are quiet. Several hours after the moths came out the teacher showed the children how to place them in pairs. They put a father moth beside a mother moth on a small piece of clean smooth paper. The mother moths laid their eggs on these pieces of paper.

The children wished to keep some of the cocoons, so they put them on clean pans into the oven of the stove in the cooking school. The oven was heated to about 200° F. If the oven had been any hotter, the silk would have been burned. They left the cocoons there for several hours. No moths came out of them.

The children were glad they had raised the silkworms, for they had seen some real magic with their own eyes.

SOME THINGS TO THINK ABOUT

1. What difference is there between the way silkworms should be fed when they first hatch from the eggs and the way they should be fed the last ten days before they spin?
2. What difference is there in the way their tray should be cleaned while the silkworms are small and the way it should be cleaned when they grow large?
3. What difference is there between the way silkworms act just before they shed their skins and at other times?
4. What differences are there between the mother and father silk moths?
5. What difference was there between what was

done with the cocoons the children wished to keep, and the cocoons out of which the moths came?

SOME THINGS TO DO

Get some silkworm eggs and raise silkworms as the children did in this story.

Draw a picture of the silkworm spinning his cocoon.

CHAPTER 29

FERNS

Do you know a fern plant when you see it?
Have you ever seen flowers on ferns?

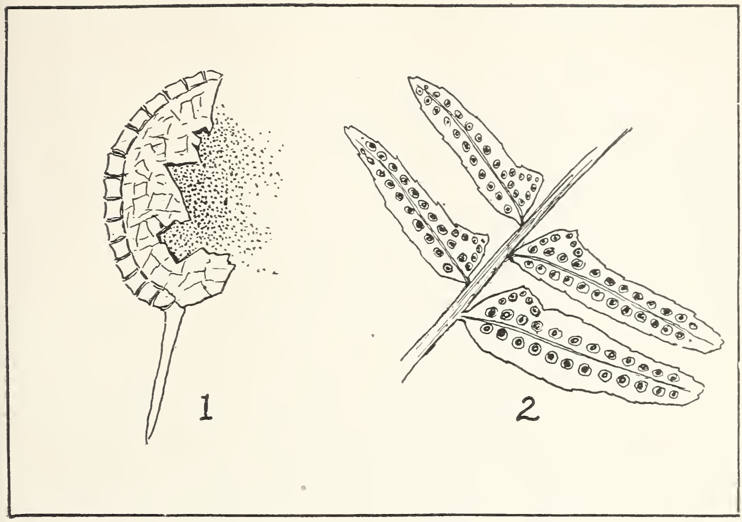
Ferns are queer plants. They never have flowers, and they cannot have seeds.

The little ferns come like magic. They grow from tiny pieces of brown dust that the plant makes. The tiny bits of brown dust are spores.

On some leaves are brown spots which only very sharp eyes can see. The spores are in these brown spots.

Billy had a strange glass that made little things look larger. When he held it over the spores, it made them look much larger. Then Billy could see them plainly. He had never looked at the fern plant with his glass before.

The children all wanted to see the fern plant

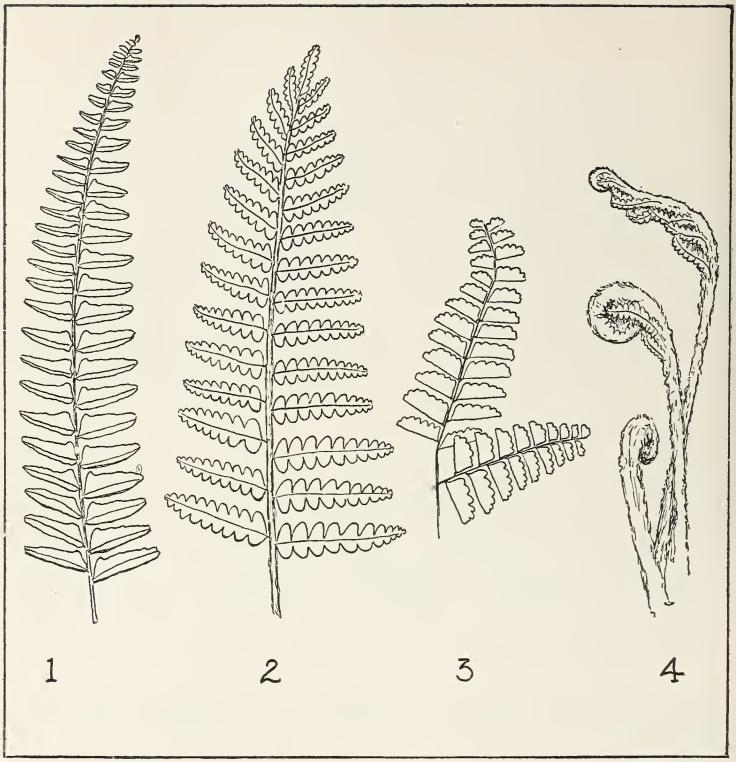


(1) THE LITTLE DOTS SHOW THE SPORES COMING OUT OF THEIR COVER. THIS IS HOW THEY LOOK THROUGH A GLASS LIKE BILLY'S; (2) THIS SHOWS HOW THE BROWN SPOTS LOOK ON ONE KIND OF FERN LEAF.

through the glass. Billy let them all look through it.

The teacher showed them the stem. It was queer looking too. The stem of a fern grows under the ground. Each year the stem grows along under the ground about one inch. You can see where the leaves grew on it last year. New leaves grow up each year from the stem. They look like the picture on the next page.

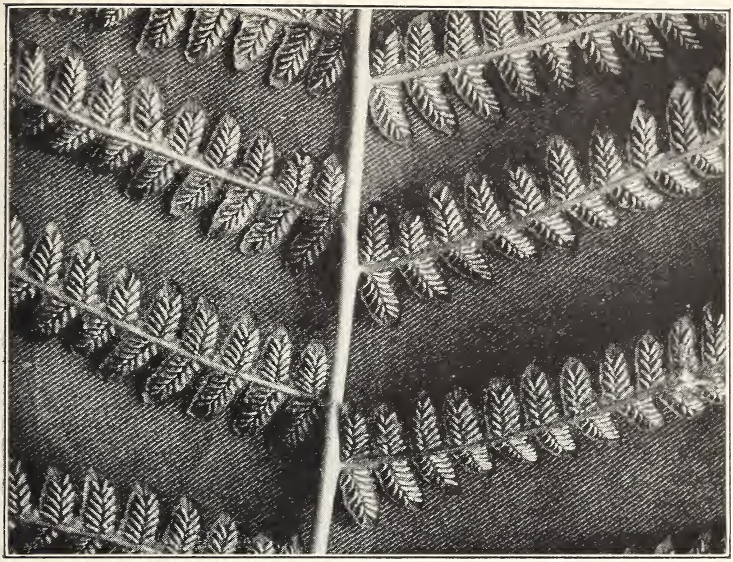
Ferns like to grow in the woods. They do



FERNS OF SEVERAL KINDS: (1) CHRISTMAS; (2) CINNAMON; (3) MAIDENHAIR; (4) YOUNG FERN LEAVES.

not like too much light. Ferns cannot grow in very dry places.

There are many kinds of ferns. Many of them have the brown spots on the leaves, but some do not have them. The brown spots help us tell some of the different kinds of ferns.



Photograph by L. W. Brownell.

CAN YOU FIND THE SPORE CASES ON THIS FERN?

The ferns have beautiful leaves. Have you ever looked at them? Each kind of fern has a different leaf. This helps us tell the different kinds.

The Christmas fern is green all the year. It grows in rocky places in the woods. The leaves are about a foot long. Sometimes you will find leaves only six inches long. Each leaf has many little leaves. These are called leaflets. On the leaflet are the bunches of spores. The spores are under the leaf.

Another fern you may find is the cinnamon fern. It grows in wet ground. Some leaves are not green. They are covered with brown cases which make the spores. The spore cases look like cinnamon. If you do not know what cinnamon is, ask your mother to show you some of it. All the spores are in the cases on the leaves that are not green. The fern has pretty green leaves too.

It is fun to watch little fern leaves grow. At first they are rolled up in a tight little bud. Then they unroll. They look as if they were covered with fine wool.

Ferns are beautiful in the woods. They are beautiful in our homes, and in school. We should know more about them.

SOME THINGS TO THINK ABOUT

From this list of words, find the right word for each row of dots.

stem leaves green seeds flowers spores

1. Ferns never have . . . . .
2. Fern plants grow from . . . . .
3. The spores usually grow on the . . . . .

4. The fern . . . . . grows under the ground.
5. The Christmas fern is . . . . . all the year.
6. Ferns do not have . . . . .

SOME THINGS TO DO

Try to find where ferns are growing.

Tell in what kind of places you have seen ferns growing.

Draw pictures of fern leaves you have seen.

Look for the brown spots on the leaves of a fern.

CHAPTER 30

SPRING AWAKENING OF THE TREES

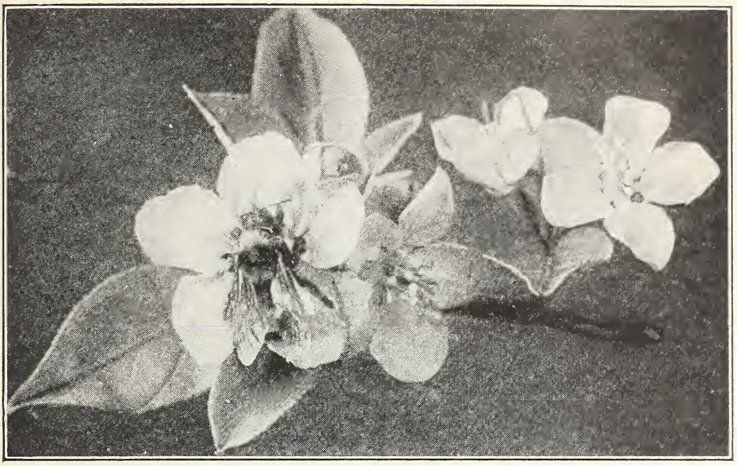
Have you been looking at the trees?
How can you know an apple tree?
What color is the cherry blossom?

The apple trees are beautiful in spring. They are covered with pink and white flowers.

Have you ever seen the buds on an apple tree? You can easily see them on the twigs. The blossoms come from the buds. The leaves come from the buds, too.

When you stand under an apple tree that is in blossom, you can hear the bees. They are very busy. They are gathering food. Bees like the pollen in the apple blossoms. The bees find a sweet juice in the flowers. This sweet juice is nectar. The bees use nectar to make honey.

The apple tree helps the bees. It gives them



Courtesy of the American Museum of Natural History.

BEES LIKE APPLE BLOSSOMS. DO YOU KNOW WHY?

food. The bees help the apple tree, too. Do you know what the bees do for the apple tree? They carry pollen from one flower to another. This helps the apple tree grow fruit. There are certain kinds of flies also that carry pollen for the apple trees. Sometimes the wind blows the pollen from one tree to another.

Soon the apple tree will not have blossoms, but it will have tiny green apples. These tiny apples grow from the flowers. It will be fun to watch them grow.

Have you ever seen a cherry tree? Like the apple tree it has blossoms in the spring. Before

Photograph from J. Horace McFarland Co.

THE CHERRY BLOSSOM IS WHITE.

the blossoms come, you can see the buds on the twigs. These buds open like magic and the flowers come from them.

The cherry blossom is white. It looks much like the apple blossom. Soon the white parts of the blossoms fall off the tree, and very sharp eyes can see tiny green cherries.

The tiny cherries have grown from the blossoms.

In the fall you read about three trees. They were the tulip tree, the sycamore tree, and the red maple tree. Did you look at these trees in the winter? You may not have known them then. They did not have leaves and blossoms in the winter. In the spring the leaves come again, and the blossoms come, too.

The blossoms of the red maple come in early spring. The queer fruit of the red maple tree grows from the blossom. In the picture you can see the keys of the red maple. Do you remember what color the keys are? The red maple is one of our most beautiful trees.

Another good shade tree is the tulip tree. It has beautiful leaves in summer, but in winter it loses all its leaves. Do you know a tulip tree in winter?

Have you seen the buds on the twigs? You can see them before the leaves come out.

In the spring the leaves come again. Then the blossoms come after the leaves are out. It will be fun to watch the buds. Have you ever watched them open?

Courtesy of the U. S. Department of Agriculture.

AN APPLE TREE IN BLOSSOM.

You can see the flowers on the tulip tree in May. Do you think they look like tulips?

You read about the sycamore tree last fall. What do you remember about it? Did you look for this tree in the winter?

You could not find the flowers of this tree last fall. Let us look for them in the spring. They are tiny and red. They come from the buds. Did you see the buds in the winter?

You may remember some trick of the magician, but you can see greater magic in these trees when flowers and leaves come from tiny buds.

SOME THINGS TO THINK ABOUT

1. Find a sentence that tells how the red maple tree, sycamore tree, and tulip tree look in winter.
2. Find a sentence that tells the color of apple blossoms.
3. Find all the sentences that tell what come out of buds.
4. Find a sentence that tells what bees do with nectar.
5. Find a sentence that tells how the flowers of the sycamore tree look.
6. Find a sentence that tells what bees carry from one flower to another.
7. Find a sentence that tells what grow from cherry blossoms.

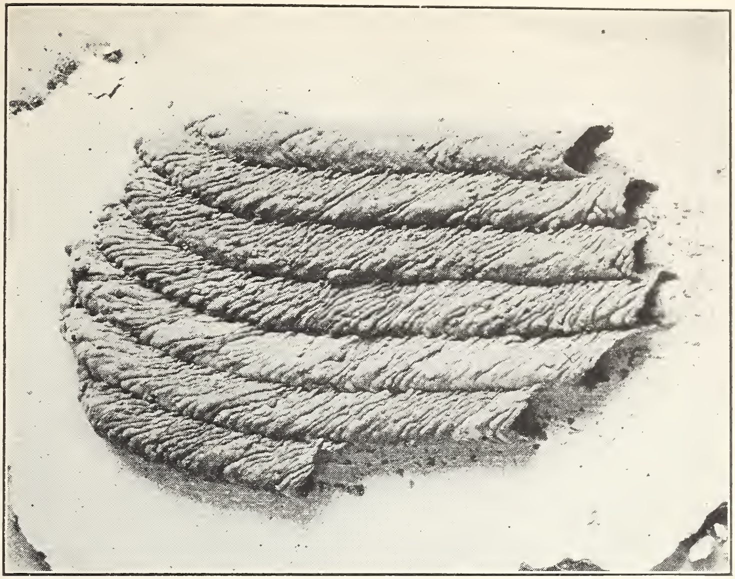
SOME THINGS TO DO

Try to find some of the trees that you have just read about.

Watch each day to see how the buds open.

Try to find bees in the flowers.

Take a trip to the woods to see the trees wake up in the spring.



Courtesy of the U. S. Bureau of Entomology.

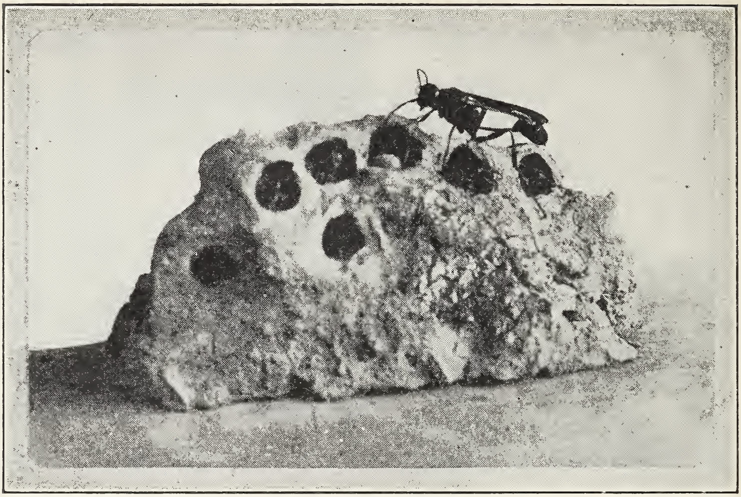
THE HOME OF THE MUD WASP.

CHAPTER 31

MORE STRANGE INSECT HOUSES

What animals live in mud houses?
Have you ever found a paper house?

Here is a picture of a mud house. Isn't it a queer house? This is the home of a queer animal. The queer animal is an insect that looks a little like a bee, except that it is a little longer. This animal is called a wasp.



Photograph by Courtesy of "Nature Magazine."

THIS WASP WORKS HARD TO BUILD ITS HOUSE.

The wasp works hard to build its house. It carries the mud in its mouth. Have you ever seen wasps at mud holes? That is where the wasp gets its mud.

These wasps build their houses in barns. Perhaps you have seen them in other places. Sometimes they make their houses in old houses that people have lived in.

The wasp begins to build her house by building one room for a little wasp to live in. Then she catches spiders and puts them in the room. She stings them but does not kill them. She does not want dead spiders. They would not keep if they were dead. The young wasp will need fresh meat to eat.

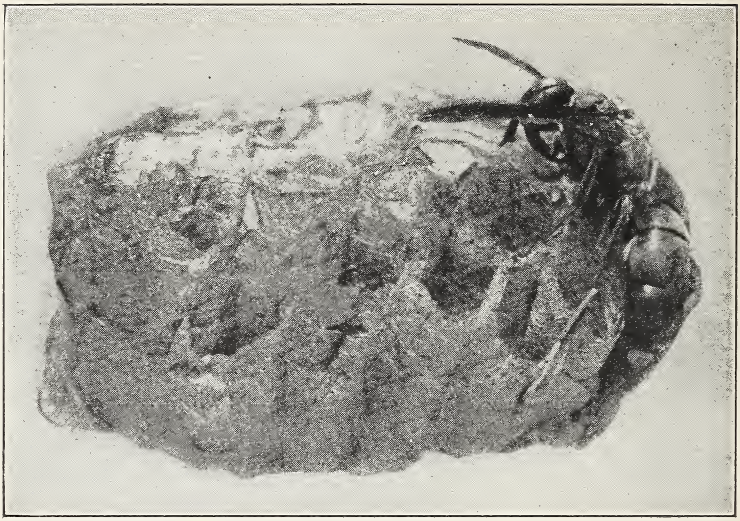
When there is food enough for a young wasp in one of the rooms, the mother wasp lays an egg and closes the room with mud. Then she builds another room to the house. She puts food in it and lays an egg in the room. Then she closes that room.

She builds until she has many rooms in her house. She puts food in each room and she puts just one egg in each room. She closes each room with mud.

As soon as an egg hatches, the baby wasp finds the food. It likes the food the mother put in its room. The young wasp grows a little each day, and before long it is ready to come out. Each young wasp makes a door in its room, as it comes out.

Would you like to live in a house made of paper? Some animals make their houses of paper.

There are wasps that build their houses of paper. They use wood to make the paper. They make all the paper for their house



Photograph by Courtesy of "Nature Magazine."

THIS WASP HAS MADE A PAPER HOUSE.

with their mouths. They chew wood into fine bits and mix it with water from their mouths. Then they use their jaws and legs to make it into thin sheets. You can see these thin sheets of paper in one of the nests. Don't you think they work hard to build this house?

In this house are many tiny rooms. The mother wasp lays one egg in each room. The egg hatches in the room. The mother feeds the baby wasp. When the baby wasp is as big as the mother it helps her work.

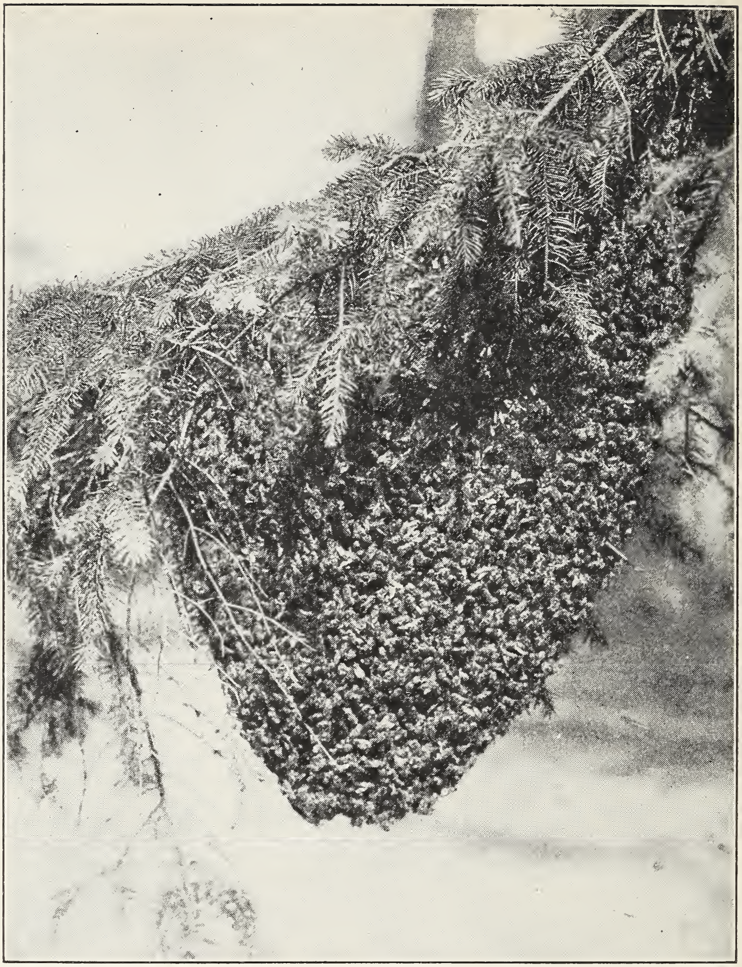
Soon the family is very large. Then the wasps make the house larger. Isn't this a queer house, too?

Sometimes honey bees fly away to the woods. They are looking for a new home. They find a tree with a hole. It must be a large hole because the bee family is large. In this hole they build tiny rooms. This is the new home for the bees. Here they store their honey and raise their family.

The rooms in the bee's house are made of wax. The queen bee lays one egg in a room. Some days she lays more than one thousand eggs. The eggs hatch in three days.

There are bees that take care of the young bees. They are the worker bees. At first they feed the young ones bee-jelly. This is food that the worker bees make. Later they feed them pollen and honey. The worker bees do the work in the home.

A young bee stays in its wax room until it changes to a bee with wings. Then it chews away the wax that holds it in the room. It comes out and works in the home for several weeks, if it is a worker bee. After that it



Photograph by Courtesy of "Nature Magazine."

A SWARM OF HONEY BEES.

goes into the fields and gathers pollen and nectar.

The bees must make the wax out of which their rooms are built. Some of the bees eat all the honey they can. Then they hang themselves to the top of their home and the wax comes out on their bodies. Other bees take this wax, and out of it make new rooms for the home.

Have you seen a bumblebee? It looks like a honey bee, but it is larger.

The bumblebee is another insect that makes its home in a queer place. A mother bumblebee finds a hole in the ground. There she begins to build her home. She makes a room of wax. Then she puts some pollen, which she gathered, in it. Last of all she lays about six eggs in it. When the eggs hatch, the young bees eat the food in the wax cell.

The mother feeds the young bees. The young bees grow for about two weeks. Then they stop eating and rest about two weeks. After this time they come out of their rooms as bumblebees. They soon begin to work, gathering pollen and honey.

The mother bee lays more eggs. When they hatch the family will be larger, so the bumblebees make their nest larger. Sometimes the nest is made larger than your head.

In the fall a young mother bee makes a hole in loose ground and lives there all winter. A mother bee is called a queen. The next spring she comes out and starts a new home.

SOME THINGS TO THINK ABOUT

Here is a list of six words. Four of them belong with the first word in the list. Two of the words do not belong in the list. Can you tell which they are?

dinner
grass
table
food
bed
cloth

Grass and *bed* do not belong in the list because they do not belong to dinner.

Find two words in each of these lists that do not belong with the other words.

wasp
mud
honey
egg
spider
wax
paper
wood
chew
mud
bee
jaws
bee
spider
queen
wasp
pollen
honey
bumblebee
hole
paper
ground
spider
wax

SOME THINGS TO DO

Try to find the mud house of a wasp. If the wasps are not using it, take it to school.

Try to find a paper wasp's nest. If the wasps are using it, do not go very near. If the wasps are not using it, take it to school.

Open a paper nest and a mud nest to see the rooms inside.

CHAPTER 32

ARBOR DAY

What trees do you like best?
Why should people plant trees?
Have you ever planted a tree?

Arbor Day comes each year. It comes in the spring. It does not come at the same time in all places. When is it Arbor Day in your city?

People plant trees in the spring and in the fall, but on Arbor Day children help plant trees. Arbor Day helps us to remember about trees.

Have you ever planted trees at home? Arbor Day is a good time to do it. Billy helped plant a little maple tree. His father dug the hole for it. He made the hole deep enough and big enough for the roots. The roots went in the hole without bending. Billy

Courtesy of "Nature Magazine."

SOME DAY THE TREE YOU PLANT WILL GROW TO BE AS LARGE AS THE PITCH PINE.

helped put the tree in the hole. Then he put good earth over the roots.

Next Billy stamped the ground around the roots. Then he put some more ground in the hole. He stamped it again. Soon the hole was full, and the little tree was planted.

For many days they watched it. They gave it water each day. Billy wondered if it would grow. He wanted to see some leaves on it.

One day he saw some buds beginning to open. Before long the leaves were out. His tree was growing.

Could you plant a tree? It is not hard to do. You might need some help to dig the hole, but you could do the rest.

Do you know what kind of tree to plant?

The cedar and the pine are beautiful trees but they do not grow very well in the city. These trees should be planted out in the country. The hickory is another good tree to plant in the country. Hickories grow in parks, too.

The other trees you have read about are good ones to plant. The tulip, the elm, the sycamore, and the maple are good trees to plant. Children may plant these in the school yard. There are many other good trees to plant. You will learn about them later.

It is best to plant a tree that is not very large. You can get little trees grown from seed in a tree nursery to plant. The first year after the seed is planted, it grows to be a tiny tree. Then it grows a little each year. It grows several years before it is ready for children to plant.

SOME THINGS TO THINK ABOUT

Here are some things to think about, and some answers. Put as many answers after each of the things as belong to it. You may have some answers left over.

tree day
tulip
dig a big hole
cedar
stamp the earth around the roots
see if the buds open in the spring
elm
pine
water it
hickory

1. Two things you must do when you plant a tree.

2. Two kinds of trees good to plant in the country.

3. Two kinds of trees good to plant in the school yard.

4. What Arbor Day means.

5. How to know whether the tree you planted is growing.

SOME THINGS TO DO

Find a place to plant a tree in the school yard.

Find a place to plant a tree in your yard at home.

Make a list of the trees in your school yard.

Plant a tree.

CHAPTER 33

PLANTING AND CARING FOR GARDENS

When do people plant seeds in the garden?
Why do we hoe our gardens?
Have you ever planted seeds in a box?

Many weeks ago the children in Billy's class had planted tiny seeds. They planted the seeds in boxes and kept the boxes in the room. It was too cold for seeds to grow out in the garden.

The children all helped plant the seeds. They learned how to put the seeds in the ground and how to cover them.

They planted cabbage seeds in one box. Then some of the children wanted tomato plants, so they planted tomato seeds in another box. They covered the ground with a cloth for several days. This helped keep the ground wet.

Photograph by Ewing Galloway.

TINY PLANTS GREW FROM THE SEEDS IN THE BOXES.

They watered the seeds each day. They watched each day for the tiny plants to come through the ground.

These tiny plants came from the seeds like magic. Plants are much larger than the seeds from which they come.

One day the teacher said, "It is time to put the plants in pots. The plants are large enough to be moved."

Again the children all helped. They took the tiny plants from the boxes, and planted them in flower pots. They watered the plants, and set them on a table by the window.

Do you know why the tiny plants were planted again? It was to help them grow big and strong. It was to give them more room to grow. In the pots the plants can grow many, many more roots.

When the warm spring days came, it was time to put the small plants in the garden.

Some of the children planted their plants in the garden at school, but many of the children took them home to plant in their gardens at home.

One day they had a lesson on gardens. The children told what they had planted. Some had planted beets and lettuce. Billy had

Courtesy of the U. S. Department of Agriculture.

THE CHILDREN DUG THE WEEDS WITH HOES.

planted beets, lettuce, spinach, and radishes. Billy liked to tell about his garden.

One day the teacher showed the children how to use a hoe. With the hoe she dug around each plant and broke the ground into very fine bits.

We use hoes to kill weeds, too. Sometimes many weeds begin to grow in our gardens. Then we must hoe to cut them down and kill them.

One day Billy's class had a lesson on flowers for the garden. The children wanted to plant some kind of flower. The teacher showed them pictures of garden flowers. They liked them all, but most of them wanted to plant nasturtiums, zinnias, and marigolds.

They bought the seeds at the store. Then one afternoon they planted their flower garden. They made rows in the loose soil. Then they put the seeds in the rows. They covered the seeds with fine soil. The teacher said, "Do not put too much soil on the seeds. They cannot come up if you do."

SOME THINGS TO THINK ABOUT

Here are the things the children did to make a garden. Put the first thing the children did first. Put the second thing second. Put the next thing they did third. Keep on until you have all the things they did in the right order.

In the spring they planted their plants in the school garden.

They took the tiny plants from the boxes, and planted them in flower pots.

The children planted the seeds in boxes.

They hoed their gardens.

They set the potted plants on a table by the window.

They kept the boxes in the room.

They watered the plants.

They watered the seeds each day.

They covered the ground with a cloth for several days.

SOME THINGS TO DO

Plant some seeds in boxes.

Make a list of the things you are going to plant in your garden.

Make a map of your garden at home.

Make a map of your garden at school.

CHAPTER 34

HOW WATER INSECTS LIVE

What insects have you seen near water?
What insects have you seen living in water?

One day Billy saw a queer insect. He did not know its name. The next day he told the teacher about it.

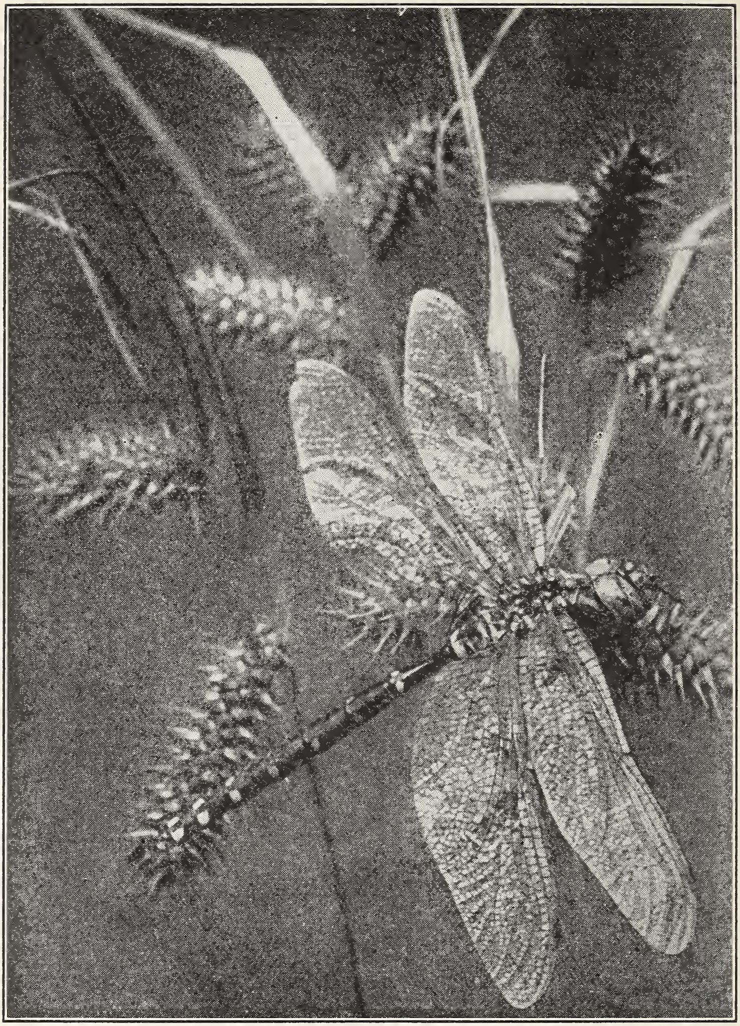
The teacher showed him some pictures. They tried to find a picture like the animal. "Here it is," said Billy. He found a picture that looked just like the animal.

The Dragon Fly

On the next page there is a picture of the insect Billy saw. It is called a dragon fly.

The dragon fly has beautiful wings. It can fly very fast. It looks like a tiny airplane.

The dragon fly has a strange, long, thin body. It has six legs, like other insects. There



Courtesy of "Nature Magazine."

THIS IS A PICTURE OF THE DRAGON FLY.

are many thousand kinds of insects and many kinds of dragon flies.

Do you know where to find dragon flies? They like to be near the water. You will find them flying over ponds if you look for them when the sun is shining. They like the sunshine. Most of them do not fly when the sun is not shining.

The dragon fly eats other insects. It flies after them and catches them in the air. The dragon fly must fly over the pond many times to get enough to eat.

The mother dragon fly lays her eggs in the water. The eggs go to the bottom of the pond. The young dragon fly does not look like the mother. It is a strange looking animal.

The young dragon fly lives in the water. It eats young mosquitoes and other insects. When it is old enough, it climbs out of the water. Then like magic the dragon fly comes out of its old skin. It will not swim any more, but, like its mother, it will fly over the pond.

Some people think dragon flies can hurt people, but they cannot. They really help us. They kill some insects that do not help us.

THE MAY FLY

Here is the picture of another insect. Isn't it a queer looking animal? It is a May fly.

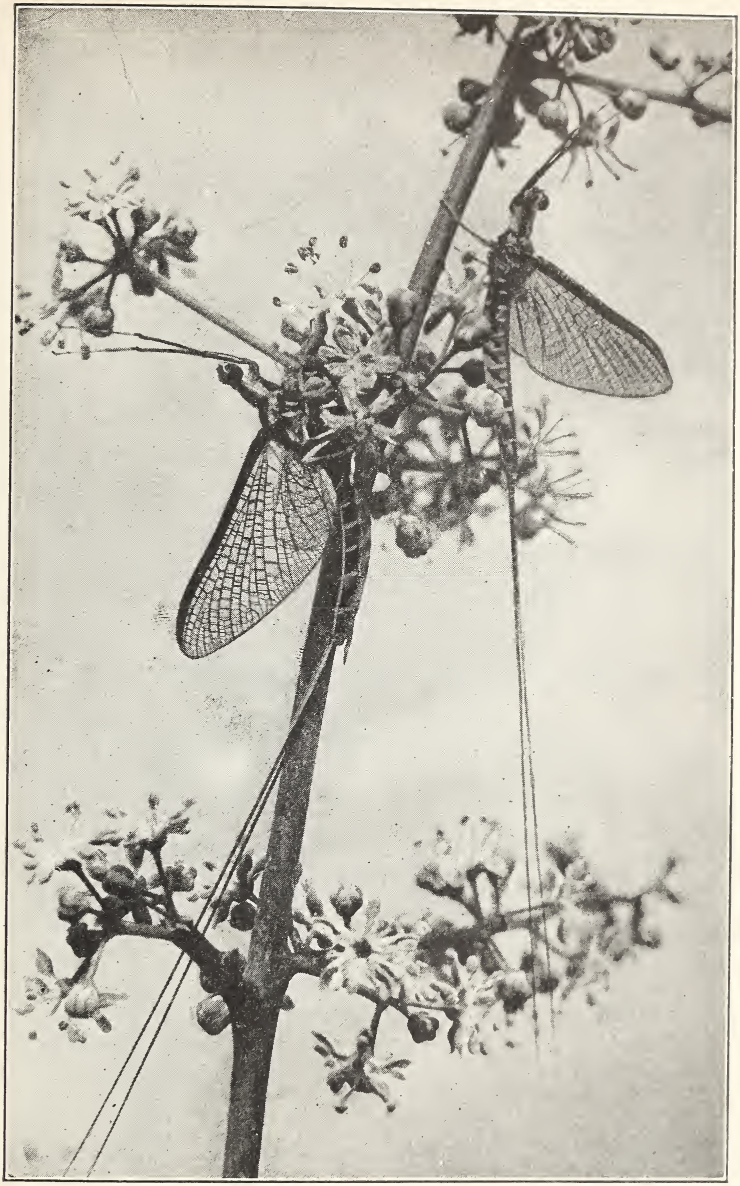
The May fly has beautiful wings. They are thin, and you can see through them. In the wings you can see tiny veins. The wings in front are large. The wings back of them are much smaller. The May fly has two long tails at the end of the body.

You do not have a long time to find May flies. They live as May flies only a few hours. Sometimes they live a few days.

If you go out in the country some afternoon in May or June, you may see the dance of the May flies. They fly about over the water of a stream. The dance may last most of the afternoon.

The mother May fly lays her eggs in the water. She may lay several hundred. Soon after she lays her eggs she dies.

The father May flies go on dancing until they cannot dance any longer. Then they die too. Their bodies are carried away by the stream.



Courtesy of "Nature Magazine."

THE MAY FLY HAS BEAUTIFUL WINGS.

The eggs hatch in about one month after the mother May fly lays them. The young May flies split their old skins and get new ones many times. They live in the water for some time before they look like the mother and father May fly. When they become older, they look like their mother and father.

Sometimes many, many thousands of them come from the lakes in spring. You can see them on the houses. You can see many, many of them on boats. If you live in the city, you may find them around the street lights.

SOME THINGS TO THINK ABOUT

Here are 18 words. Make two lists. At the top of one list put *Dragon fly*. At the top of the other list put *May fly*. Put all the words that belong with *Dragon fly* under that word. Put the words that belong with *May fly* under that word. Some of the words belong in both lists. Some do not belong in either one.

airplane
insects
tails
eggs
enemy
dance
street lights
water
sunshine
boats
birds
wings
legs
new skin
pond
lake
stream
tiger

SOME THINGS TO DO

Make pictures of the young dragon fly.

Make pictures of dragon flies.

Make pictures of the young May fly.

Make pictures of May flies.

Make an aquarium for water insects. Put some water insects in your aquarium. Watch them every day.

CHAPTER 35

THE LIFE STORY OF THE CICADA

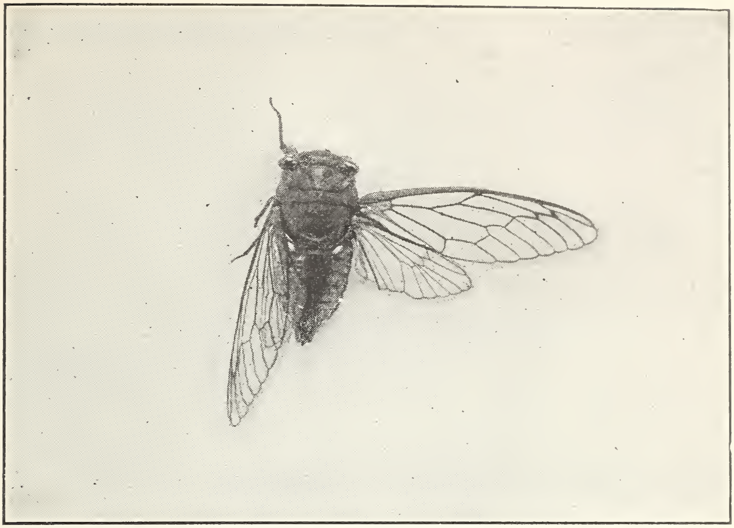
Have you ever heard the cicada sing?
Can the cicada hurt people?

The cicada is an insect that looks something like a very large fly. Cicadas are sometimes called harvest flies and locusts, but they are not real locusts.

The cicada has four wings. They are thin so that you can see through them, and they have dark lines marked on them. You may see a "W" marked on the front wings.

The head of a cicada has a strange shape. The lower part of the head comes to a point and turns back. The point is the mouth of the cicada.

The top of the cicada's head is wide. The large eyes are on the sides of the head. They are bright green.



Courtesy of the American Museum of Natural History.

CAN YOUR SHARP EYES SEE THE "W" ON THE CICADA'S WING?

Have you ever seen an insect like this? You can find them sometimes in the late spring or early summer. You can always know the cicada. It has a large, thick body. Its wings are beautiful. Can you find the "W" on the wings?

If you do not see cicadas, you can hear them. Have you ever heard their song? The mother cannot sing. The father must do all the singing.

He makes his music with two little drums. One drum is on each side of the body. You will find the drums near where the wings are fastened to the body.

The mother cicada makes a little hole in a twig. In this hole she lays her eggs. When the eggs hatch, the little cicadas come out.

The young cicadas do not stay on the tree very long. They soon fall to the ground. Often the twig on which the eggs are laid is broken off by the wind. When the young cicadas fall to the ground they dig their way in. Their front feet are made for digging.

Far under the ground they make a little room. Here they live for a long time. Some of them live under the ground two years. Some of them stay in the ground for seventeen years.

The young cicadas do not look like the mother cicada. They are strange looking animals. While under the ground they change their coats several times. In the picture you can see one of the young cicadas.

This strange looking animal comes from the ground. It cannot fly, but it can climb. The young cicada climbs a tree. Then the skin breaks and the cicada comes out.

Photograph by L. W. Brownell.

THE SKIN BREAKS AND THE CICADA COMES OUT.

Have you ever heard any one say that the cicada could hurt you? Some people say they can, but that is not true.

SOME THINGS TO THINK ABOUT

Here are five beginnings of sentences, and seven endings. Put the right ending on each sentence. How many endings will there be left over?

Beginnings

1. The cicada's front wings are marked
2. The father cicada makes music

Beginnings (*Continued*)

3. The mother cicada lays her eggs
4. A young cicada digs its way into the ground
5. Some young cicadas stay in the ground

Endings

1. With its front feet.
2. In a hole in a twig.
3. With its mouth.
4. With a W.
5. For seventeen years.
6. In the mud.
7. With two little drums.

SOME THINGS TO DO

Try to find some of the skins of the young cicadas.

Try to catch a cicada.

Draw a picture of the cicada.

Tell in what places you have seen the cicada.

CHAPTER 36

ANIMAL COUSINS

What wild animal have you seen that looked like a dog?

Did you ever see a wild animal that looked like a horse or a cow?

Some animals have lived with people for thousands of years. Horses have. Cattle have. Dogs have. For thousands of years these animals have worked for people, and people have taken care of them. People have given them food and a place to live. We call them domestic animals.

There are other animals that have always taken care of themselves. They have hunted for their own food. They have found places in which to live. They have had to fight to keep other animals from killing them. We call them wild animals.

Courtesy of "Nature Magazine."

THE FOX IS A RELATIVE OF THE DOG

Until people took some of the animals to live with them and work for them, all animals were wild. There were wild horses and wild cattle and wild dogs.

Our domestic horses, cattle, and dogs have relatives that are still wild. If you could travel to many lands, you would see these wild relatives. There are three places, near home, where you can see some of them. They are the zoo, the circus, and the museum.

Out at the zoo there is a wild animal that is a relative of an animal you know well.

The animal is a little more than three feet long. It has a coat of long, soft hair and a long, bushy tail. Its nose is long and pointed. It has bright eyes and pointed ears. Its teeth are sharp. With them it tears meat from bones. It eats birds and animals that it catches. It has strong legs and can run fast. It is a very intelligent animal.

Can you guess whether this animal is a relative of the horse, the cow, or the dog?

The animal is the fox, a relative of the dog.

Some foxes are brown-red. Others are gray. They make dens to live in by digging a hole in the ground. The father fox has a den of his own. It is near the den of the mother fox. While she stays in her den to take care of the little foxes, the father fox brings food to her. Often the mother fox makes an open nest in the grass for her babies.

Foxes go out to hunt for food in the early morning, or in the evening. They are often out at other times of the day and night, too.

They like to eat chickens, and often rob hen roosts. When a fox catches a hen, he carries her back to his den for dinner. He holds the hen's head in his mouth. He throws her

Courtesy of the American Museum of Natural History.

FOXES LIKE TO EAT CHICKENS.

heavy body over his shoulder. This is a good way to carry a heavy load.

Foxes are very wise. They show this in many ways.

When hunters and their dogs are after the fox, he has many tricks to help him. One of the best ones is to follow along behind the hunters. They think they are following him.

Another trick is to cross a stream on ice that is so thin it just holds the fox, but breaks as soon as the dogs step on it.

Sometimes when a fox gets a long way in front of the dogs, he turns around and comes back along the same track. After he has come back a little way he jumps to one side, and goes off in a new direction. Dogs follow the tracks with their noses. Can you see how this trick would throw the dogs off the track?

Foxes bark, but their bark is high and sharp. It is not just like a dog's bark.

Foxes sometimes make friends with dogs that live near them. Some dogs and foxes like to play together.

The dog has another wild relative called the wolf. The cow has a wild relative called the buffalo. The horse has a wild relative called the zebra. If you will look for them you can see these wild relatives in the zoo or the museum. There will be men there who will tell you about them, if you ask.

SOME THINGS TO THINK ABOUT

1. This story tells of three kinds of domestic animals. What are they?
2. It tells of two wild relatives of the dog. What are they?
3. It tells of three places near your own home where you can see wild animals. What are they?
4. It tells eight things by which you may know that the fox is a relative of the dog. What are they?
5. It tells two colors of foxes. What are they?
6. It tells three tricks that foxes use to escape their enemies. What are they?

SOME THINGS TO DO

Go to the zoo to see wild relatives of domestic animals.

Look for their pictures.

Draw their pictures.

Watch a fox and tell some ways in which it is not like a dog.

CHAPTER 37

LOOKING FOR REAL MAGIC

Have you seen any of the things you have read about in this book?

Which one of them would you like most of all to see now? Why?

It was near the end of May, almost time for school to close. Billy and his friends in the third grade had studied science all year. They had read about and seen most of the things you have found in this book.

Now they were going to find out how much they remembered. They were going out in the woods to look for real magic.

"How shall we go?" asked Ned.

"Let us go in the big school automobile," said the teacher. "Perhaps some of your mothers will go with us."

Mary said, "Let us go next Friday if it is not too cold. That is the last Friday in May."

So they asked their mothers to go with them to the woods on the last Friday in May. Not all their mothers could go. Billy's mother could. Ned's mother, Mary's mother, and the mothers of three other children said they would go, too.

On Friday morning all the children were ready. They all ran to the thermometer that hung outside the schoolroom window. The bright line stood at 72°. It was a warm spring day.

They got into the big automobile and started for the woods. The teacher and the mothers were with them.

"Let us play a game while we are riding," said the teacher. "Watch for animals along the road. Each time you see an animal before the other children see it, you get one point. The child who gets the largest number of points wins the game."

They looked for horses, cows, chickens, ducks, geese, turkeys, dogs, crows, song sparrows, flickers, dragon flies, May flies, wasps, and bees.

Ned won the game. He saw the largest

number of animals before the other children saw them.

Soon they reached the woods. Everybody got out of the automobile and went to find a place to eat lunch. Billy's mother found a good place under a large oak tree, and the mothers started to get the lunch ready.

The children looked for magic.

"See how many things you find that you can name," said the teacher. "We will play a game of naming things. I wonder who will win."

Mary won. She found bluebells, bloodroot, hepatica, wild phlox, ferns, a frog, a maple tree, and some bees and wasps.

Then lunch was ready, and the children went back to the big oak tree.

After lunch they picked up all their paper and scraps. They wanted the woods to stay clean and beautiful.

They looked for some more of the magic of the woods. They found a tiny oak tree.

"Let us find the seed from which it grows," said the teacher.

They dug the ground away. Then they could

THEY FOUND A TINY OAK TREE.

see that the tiny tree was growing from an acorn.

"That is real magic," said Billy's mother. "We will put back the soil we have dug. This tiny plant may grow to be a large oak tree."

They found a wonderful little house on a leaf of the big oak tree. It was round and brown. The oak tree had made the house for some baby insects. It was an oak apple. There were no insects in the house when the children found it.

They found some flowers on a May apple

THEY CLEANED UP THE PICNIC THINGS.

plant. On one plant they found a tiny May apple.

They saw many new kinds of trees and many beautiful spring flowers. The teacher showed them the magic yellow dust we call pollen. They saw insects gathering nectar.

The children liked to hunt for magic. They had a good time in the woods.

They did not pick the flowers. They left them to make seeds for next year. They were so quiet that they did not frighten the birds nor the other little animals.

The children wanted to see everything they could. They moved slowly and spoke softly. They did not go too close.

Then later the children had another picnic under the trees in the woods. When they had finished, they carefully cleaned up the picnic things.

The teacher said, "I am glad you have outdoor good manners."

The children were tired, but they were not ready to go back to school.

The big automobile was waiting to take them back. "I will bring my father and mother to these woods," said one of the children. "I want them to see this place, too."

SOME THINGS TO DO

Make a trip to the park or the woods.
Watch for real magic.
Play the games that this story tells about.
Write a story about a trip to the woods.

SUGGESTIONS TO TEACHERS

General

1. The theme of this book is the wonder of the world in which we live. It should be presented without sentimentality or mysticism, but in such a way as to inspire interest in and reverence for the universe. Children should be encouraged to look for real magic in the out of doors, and to report as many instances of it as they find.

2. First-hand observation of each subject in its natural surroundings, and preliminary discussion based more or less upon the introductory questions of each chapter, are essential to securing the best values from the reading of this book.

3. No teacher need hesitate to take her class outdoors for study because of limitations of her own knowledge. Begin very simply, with only the most familiar objects, and a very limited number of them. The subjects of the various chapters in the book are such things as may be found by anyone within a short distance of almost any school.

4. The following correlations are suggested, in so far as they fit the ability of the group, and are appropriate to the subject—oral and written expression, drawing, painting, paper-cutting and toy-making, songs, stories, poems, dramatization, games, scrapbooks, and collections.

CHAPTER 1

A trip to a vacant lot to find goldenrod galls and other galls will help make this lesson mean more than mere words to the pupils.

The pupil may find many other kinds of galls in the woods. Ask him to bring in the galls which he finds. Select the best specimens and mount them on cards or put them in cases such as are supplied by the supply houses for this purpose. Label the galls, using available keys and bulletins. These collections will be a valuable addition to the school museum.

CHAPTER 2

A trip out of doors to look for and collect seeds is the best preparation for this lesson. Other trips, taken as a class or independently, should follow the reading.

Seeds should be collected, and classified according to the means by which they move about.

A sand table showing seeds, a museum collection of seeds in boxes, and a seed chart may be made.

CHAPTERS 3 AND 4

Milkweed caterpillars, and monarch butterflies and chrysalises can be found in September. The children should bring in enough for observation, but if they are unsuccessful in finding them, the teacher should provide them. Do not keep the caterpillars in too dry an atmosphere.

Precede the reading with study of the actual material.

If cecropia caterpillars can be found, let the children observe them for the same points as are brought out in this chapter. Cecropias feed on shade trees and orchard trees. They make cocoons suspended like hammocks below the twigs, and emerge as cecropia moths.

The big box for the caterpillars may be as simple as the one described in the chapter. An older class working in the manual training shop would find a first-class project in making such a box for the third grade. Directions for making a cage of simple type are given in *The Source Book of Biologi-*

cal Nature Study by E. R. Downing, p. 57, as well as in *The Handbook of Nature Study* by A. B. Comstock, p. 375.

Care of caged caterpillars is described in the text.

Encourage close and repeated observation, as well as the discovery of facts not given in the text.

Chapter 5

If the children are taken for a walk, they will enjoy picking out the tulip, sycamore, and red maple trees. Perhaps they can draw them in simple outlines.

The leaves may be mounted on paper and labelled. Specimens of the fruit may be collected and kept.

Chapter 6

On bird trips children have every incentive for practising outdoor good manners, because they fail to see what they go for unless they move slowly and quietly, and remain at a respectful distance. Ears as well as eyes should be trained. It is often less difficult to recognize and locate a bird by its voice than by seeing it. The drumming of the woodpecker and the rattle of the kingfisher are so distinctive that they are easily recognized and remembered.

Chapter 7

A trip to some pupil's garden will stimulate interest in gardening. If any of the children have had gardens, let them tell of their gardening experiences. Let them bring products from these gardens to school to show to other children.

Chapter 8

Thistles should be studied out of doors. To supplement such observation a thistle plant should be kept in water in the schoolroom. It may be taken up by the root for this purpose.

Have the children bring in Queen Anne's lace, phlox, and salvia for classroom decoration. They may then make repeated observation of them.

Chapter 9

Trips to orchards for information regarding the picking, storing, and shipping of fruit, and trips to market to identify the different kinds of apples, oranges, and peaches will be found helpful in stimulating the child's interest and increasing his information. A fruit exhibit is similarly useful. The child should be able to tell the essential structural differences between the different kinds of fruit.

Chapter 10

A request for the loan of a pet raccoon, made to every class in your school building, may bring the animal desired for study to your classroom.

Pet animals, brought to school for study, should be exhibited by their owners, at least until they have become thoroughly at home in their new surroundings. Care must be exercised in allowing the children to handle any animal until they are well acquainted with it. Further care lest the animal is handled too much for its welfare and comfort is necessary.

Other sources of material, in the order of their desirability, are the zoo with its live raccoons, the museum's mounted specimens, and pictures. The last named, if they are the only available material, may excite sufficient interest to lead the children to make independent observations as they have opportunity. It is not hard to find stories of raccoons and these will add to the interest.

Chapter 11

Laurel and winterberry are also in danger of destruction. Use as substitutes for Christmas greens:

Fiber wreaths and chains from five and ten cent stores.
Wreaths of privet.
Wreaths of cardboard cut in the shape of holly, etc., and colored.
Pine and pine cones.
Potted plants, such as dwarf evergreens, coral ardizia, Jerusalem cherry, dwarf orange.

CHAPTER 12

Song sparrows are numerous, but are commonly mistaken by the unobservant for English sparrows. Training children to distinguish between the two is excellent development for their powers of observation.

Emphasize the value of sparrows as seed-eaters, and of the song sparrow in particular as a desirable neighbor. Unfortunately the unpleasant qualities of the English sparrow have given a bad reputation to sparrows in general, except with persons versed in bird lore.

CHAPTER 13

It is possible to make dew in the schoolroom. Fill a drinking glass with water and a piece of ice. When it is taken to a warmer room, dew will form on the outside of the glass. A bright tin can may also be used for this experiment.

CHAPTER 14

Dairy farms in the vicinity of cities make it possible for the teacher of a city school to give her class opportunity to study cows at first hand. Such farms, as well as other places chosen for visits, should be notified in advance, so that arrangements can be made to show the class the greatest number of interesting things with economy of time and effort. Feeding and milking are interesting to the children.

As on other expeditions, quiet and order on the part of the class are essential. Children should not go too near the cattle. Most cows are gentle, and if these points are followed, there should be no difficulties connected with the trip.

CHAPTER 15

Encourage the children to take readings from thermometers. The set of materials by the Welch Manufacturing Co., Chicago, Ill., contains thermometers for the experiments suggested under *Some Things To Do.*

Chapter 16

Many animals, gentle at other times, are easily excited when they have young to protect. It is therefore essential that the teacher should make sure that the mother dog, brought to school with her puppies, is absolutely gentle. The teacher must be watchful lest the children handle the puppies too much. It is natural for every child to wish to do so, but such procedure would be injurious or fatal to the young dogs. They can be best observed without handling.

Puppies nursed by their mother should not be fed. A puppy that is no longer with its mother should be given at least three meals a day of bread, milk, green vegetables, and food prepared at pet stores. Older dogs should have two meals a day, meat being given once a day. All small sharp bones should be removed. Many dogs have died as the result of swallowing such bones. Running food of a puppy through a meat chopper is a wise precaution.

Chapter 17

It is not hard to find the North Star as it is on a direct line with the pointers of the Big Dipper. If you extend this imaginary line through the North Star a distance about as great as that of the Big Dipper from the North Star, you will find above the line the W which is Queen Cassiopeia's Chair. Cassiopeia's Chair is on the side of the North Star opposite the Big Dipper.

Young children cannot find the star groups in the sky for themselves. They must be shown by an older person. Where a star party is practical the teacher may meet a group of limited size in the neighborhood of the school, to study the stars. With third-grade children this must be done early in the evening, if at all, and careful arrangement must be made for the children's being brought and taken home. Parents and older brothers and sisters are often able to point out the Dippers and other familiar star groups. The teacher should urge each child to have this done for him at home, if the star party seems inadvisable.

Chapter 18

Stories of Orion can be found in

Stars in Song and Legend, Porter
Stars and Their Stories, Griffith
Storyland of the Stars, Pratt
Stories of Starland, Proctor
The Music of the Spheres, Grondal

Chapter 19

No class should fail to see chickens and ducks on the farm before reading this chapter. A hen and a duck in the classroom make possible more detailed study, and correlation of other work. These birds, so easily available, offer the best possible beginning for study and comparison of structure in land and water forms.

Suggestions for their care in the classroom have been given in the text.

Chapter 20

The teacher may show the children how to find the colors of a rainbow in using a prism. When the sun is bright some afternoon in the summer or early fall, a rainbow may be made in sprinkling the lawn. The children should be given some idea of the colors which appear in a rainbow.

Chapter 21

A bar and horseshoe magnet should be used to demonstrate this lesson. These can be obtained in the set prepared by the Welch Manufacturing Co. The children will enjoy making magnets of other steel objects, such as a sewing needle.

Chapter 22

The crow is our most intelligent and in many respects most interesting bird. It can be seen anywhere, and no bird is better calculated to stimulate interest in bird life, if the whole truth is presented.

Few children can write a poem as perfect as John Leckie's, but sympathetic appreciation of effort in that line often leads to surprising results. No subject affords greater inspiration to juvenile literary endeavor than Elementary Science.

Chapter 23

It is important that materials be available for use with this chapter. Get the children to bring in rubber combs, glass rods, pieces of wool and silk cloth.

Allow the children to bring some of their electrical toys to school.

The set for this grade by the Welch Manufacturing Company contains these materials.

Chapter 24

Ask the children to bring some of their own whistles to school and to explain to the other children how they work. The rye plants cannot be used until the stem is hollow. This will be when they are about 2 feet high. The Welch set for this grade contains a whistle.

Chapter 25

Instructions for making a tadpole aquarium, and caring for tadpoles may be found in Comstock's *Handbook of Nature Study,* Vol. I.

Chapter 26

It should be easy to find flickers in almost any locality. As they spend much time on the ground in search of ants, they are easily observed.

Flickers have many amusing characteristics and will prove a most interesting bird for study. Compare them with other woodpeckers.

Chapter 27

The teachers should have specimens of the bloodroot, hepatica, and wild phlox to show to the children. After they know the flowers, a trip may be taken to find them. If a child is interested in any other wild flower he may have seen, the following books will be useful in helping him to look it up: Burgess, *The Flower Book for Children;* Read, *Flower Guide;* Matthews, *Familiar Flowers.*

The children should not be allowed to pick the flowers they see.

Chapter 28

Write T. A. Keleher, Bureau of Entomology, Dept. of Agriculture, Washington, D. C., for his pamphlet "The Culture of the Mulberry Silkworm."

Natural-history supply houses make a business of furnishing such material as silkworm eggs.

Chapter 29

It is fairly easy to care for a fern in the schoolroom. The children may bring in different specimens to display or the teacher may get some from a florist or possibly from the woods. The children should be shown the brown spots or sori on the ferns. They will enjoy seeing these through a hand lens or reading glass.

Chapter 30

The children will enjoy bringing in specimens of apple, plum, and cherry blossoms. A short field trip will help in identifying the flowers of the tulip, sycamore, and red maple trees.

Chapter 31

If they have them, the children will be glad to bring in the nests of the mud and paper wasp for this lesson. If there is a nature museum, such specimens should be kept there from year to year.

Chapter 32

There are many activities which will lead up to the program on Arbor Day, such as cleaning up the school yard, writing essays and helping to plan the program.

Fourteen Points for Tree-Planters[1]

1. A piece of burlap or canvas should be spread over the grass, so that the dirt from the holes may be thrown upon it.

2. Holes must be made large enough for the roots to spread out naturally without cramping.

See also No. 6.

3. Dig holes larger in circumference at the bottom than at the top to prevent water from lying about the roots.

4. Good fertile topsoil must be used about the roots. If the tree is to be planted in impoverished ground, good soil should be provided for it.

5. Plant the tree the same depth it stood at the nursery (easily determined by the dirt ring on the trunk). This is very important.

6. Lay the roots out naturally and cut off all the broken or bruised parts. See also No. 2.

7. Press the earth down firmly, embedding every particle of roots and working it in under the crown.

8. With small trees the dirt will settle firmly if the plant is moved gently up and down as the hole is filled. With large trees use tamping stick.

9. Pour in water to the top of the hole after filling it three-quarters full with earth. When this is settled, complete the filling-in process, leaving the topsoil loose.

10. Trim the broken or bruised branches, and also the small branches and limbs back to next largest stem.

11. It is often best not to trim the leader or central stem, as a forked tree may result. Hardwood trees, like the oak and beech especially, should not have their central leader trimmed.

12. Large trees or trees in exposed places should usually be staked. To prevent chafing, protect the tree with old hose or with burlap and sticks where wire is attached.

13. After planting, it is better to leave a cultivated area about the tree than to sod close to it. This cultivated area should be from three to five feet in diameter.

14. Fertilizer, as manure or compost, may be used either in the bottom of the hole or as a mulch, or both. Be careful not to allow manure to come in direct contact with the roots.

---

[1] From *Nature Magazine,* April, 1927. Reprinted by permission.

CHAPTER 33

If pots are not available, little boxes may be obtained at the grocery store. Fill the boxes with good soil and have them ready for the seeds about March 1st. Boxes with sides about three or four inches high are best for this use. Paper cups or little boxes can be used in transplanting the cabbages and tomatoes also.

The children will enjoy seeing the spring work in some garden near the school, at this time. This should stimulate them to make gardens of their own during the summer.

CHAPTER 34

Specimens of the dragon fly and May fly may be collected and placed in insect cases to use with this lesson.

Ask the children to look for these insects in the field.

Directions for making an aquarium for water insects, will be found in Comstock's *Handbook of Nature Study,* Vol. 1, p. 380.

CHAPTER 35

It is important that specimens of the cicada fly be shown in connection with this lesson. Ask the children to collect them for the school museum.

CHAPTER 36

Interesting studies of wild relatives of other familiar domestic animals, similar to this study of the fox, may be made.

There are many good stories of foxes. A few, well selected, will stimulate interest.

CHAPTER 37

The subject matter of the lesson suggests a project.

WORD LIST

The following list arranged by pages contains words on which the teacher may desire to drill before the reading of the story is undertaken.

1 magic
Cinderella
driver

2 godmother

3 thimble

4 magician
downy
ripple
floats

5 magnet

6 insect

8 wasp
trick
galls

10 willow

12 dandelion

13 maple
milkweed
burdock
cocklebur
beggar tick

14 pod

17 hook
berries

20 monarch

21 splits

22 stripes
crawl
whips
jaws
sideways

23 chrysalis
fence rail

27 crumpled

28 perfume
honeysuckle

30 flocks

32 shade
summertime

34 greenish

35 sycamore

36 walnut

39 woodpeckers
kingfishers

40 bib

41 drummer boy
mate
telegraph pole
drumstick
sawdust

42 acorns
beechnuts
stiff
prop

43 pillow

44 brood

45 rattle
dives

46 fins
throat
crest
freezes

47 beginning

50 ditch
geraniums

51 transplant
spade (?)

52 aster
cosmos

55 roadside
weed
thistle
lance
lance-leaved
spine
prick

57 nectar
pollen

59 Queen Anne's lace

60 phlox
salvia

62 fuzzy
watermelons

64 core

66 peel

68 vines
melon

70 coarse
raccoon
goggles
bushy

72 roosts
snakes

77 cone

80 holly
crowfoot
decorations

82 sparrows

85 harsh
chirp

87 perches
cheery
junco
white-breasted nut-hatch
chickadee

88 dogwood

91 raincoats

94 frozen

95 pasture

96 stomach
knee-deep
cud

98 udder
dairy

99 bellow
hoof
beef

101 thermometer
alcohol

102 mercury

103 comfortable

104 zero

106 goldfish

107 collie

108 barnyard
growled
airedale

110 Eskimo dog
gnawing

111 ashamed

112 mischief

114 dipper
farthest
pointers

115 Cassiopeia's Chair

116 nymphs
dragon

117 untied

119 Orion

120 Betelgeuse
Rigel

121 waist

122 Sirius
sparkles
Procyon
hunter
club

125 waddles

126 paddles
scratching

127 perch
dive
strainer
gizzards
oil sac

129 Cock-a-doodle-doo
drake

130 museum

131 rainbow

132 indigo
prism

135 horseshoe

138 theatre
cardboard
players

141 flaps
intelligent
caw
dull
cellar
sloped
powder

143 scarecrows

146 poem
mister

Washington, D. C.
saucy
cornfield

147 glowing
pest
lonesome
drear
intelligence

148 verses

149 electricity

152 electrical
refrigerators
motors

153 chapter
sweater

154 thumbs

156 rye

160 toad

161 slippery

162 throat

163 jelly
tadpoles
wriggling

164 shallow
aquarium

166 flicker
moustache

170 telegraph

172 bloodroot

174 medicine
hepatica

175 wilt

176 bluebell
phlox

178 riddle
silkworm
mulberry

181 mosquito netting

183 temperature

184 bundles

185 cocoon

188 ferns
spores

191 leaflets

192 cinnamon

194 awakening

201 wasp

202 spiders
sting

205 wan
worker

207 bumblebee

210 Arbor Day

212 cedar
hickory

213 nursery

218 spinach

219 nasturtiums
zinnias
marigolds

221 dragon fly

224 veins

228 cicada
harvest flies
locusts

230 seventeen

233 domestic

234 relative

235 den

238 buffalo
zebra

239 science

241 scraps

INDEX

Airedale, 108-110
Apple, 64-66
Apple tree, 194-195, 198
Arbor day, 210-214

Bees, 205-209
Birds, 39-47, 82-89, 141-148, 166-171
Bloodroot, 172-174
Bluebell, 176

Cabbages, 50
Calf, 97
Cassiopeia, 115-118
Caterpillars, 19-24
Cherry blossom, 196
Chickens, 124-129
Christmas fern, 190
Christmas greens, 80
Christmas tree, 76-80
Cicada, 228-232
Collie, 106-108
Cow, 95-100
Crow, 141-148

Dew, 91, 92
Dogs, 106-113
Dragon fly, 221-224
Ducks, 124-127

Electricity, 149-153
Eskimo dog, 110, 111

Ferns, 188-193
Flicker, 166-171
Flowers, 172-178
Fox, 233-238
Frog, 160-165
Frost, 93, 94
Fruits, 62-69

Gardens, 48-54, 215-219
Geraniums, 50
Goldenrod gall, 10

Hepatica, 175
Holly, 79

Kingfisher, 43-47

Magic theatre, 138
Magic, 1-5, 139, 239-244
Magnets, 135-140
Maple, red, 36, 37, 197
May fly, 224-227
Milk, 95, 98
Monarch butterfly, 20, 26-30
Moth, silk, 179-187

Oak apples, 7-9
Oranges, 65-66
Orion, 119-123

Peaches, 64-66
Phlox, wild, 176
Pine, pitch, 76-80
Potatoes, 49
Prism, 132-133

Queen Anne's lace, 59-61

Raccoon, 70-75
Rain, 90, 91
Rainbow, 132

Seeds, 12-18, 52
Silk, 179-187
Sparrows, 82-88
Stars, 115-118, 119-123
Sun, 131-133
Sycamore tree, 35, 36

Tadpole, 163, 164
Thermometer, 101-105
Thistle, 54-58
Toad eggs, 163
Tracks, 73
Trees, 32-36, 194-200, 210-214
Tulip tree, 33, 34

Vegetables, 49

Wasps, 8, 201-204
Water, 90-93
Watermelon, 67, 68
Weeds, 55
Whistles, 154-159
Winter birds, 82-89
Woodpecker, 40-43

(1)